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AMERICAN JOURNAL OF PUBLIC HYGIENE

AND JOURNAL OF THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH

SAMUEL H. DURGIN, M. D. . . . . Editor

CONTENTS:

at

EDITORIALS—

PAGE
Milk Supplies (*W. H. Parker*) 286
Plumbing Reform (*Baker*) 290
Pseudo-filtration (*Weston*) 292
Death Rate Fallacies (*Fulton*) . . . 294
JANUARY MEETING — Boston, Mass. . . 296
PREVENTIVE THERAPEUTICS (*Pease*) . . . 315
VETERINARY SANITATION (*Moore*) . . . 320
MUNICIPAL SANITATION (*Chapin*) . . . 322
VITAL STATISTICS (*Fulton*) 325
CANADIAN NOTES (*Amyot*) 328
SANITARY ENGINEERING (*Weston*) . . . 329
LABORATORY WORK (*Gorham*) 332

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AMERICAN JOURNAL OF PUBLIC HYGIENE

AND

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THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH was organized in Boston, March, 1890, *with the following objects; The advancement of sanitary science; the promotion of better organization and co-operation among local boards of health, and the uniform enforcement of sanitary laws and regulations*

THE JOURNAL OF THIS ASSOCIATION has for fifteen years faithfully reflected the views of the public hygienists of Massachusetts. With the November issue of the year 1904, *the encouragement received from many hygienic quarters induced the Association to undertake the expansion of the Journal to a national standard, with the co-operation of many noted sanitarians as editors. A new title was selected, while the older and well-established title was retained also.*

The dates of publication are FEBRUARY, MAY, AUGUST *and* NOVEMBER *of each year.*

THE JOURNAL will contain the papers read at the meetings of the Association, papers contributed by hygienists, reports of the discussions, editorials, abstracts, reviews and hygienic notes of professional interest. Subscription rates, $1.00 *per year. Reprints furnished at cost price.*

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All communications concerning the ASSOCIATION should be addressed ta the Secretary of the Association, JAMES C. COFFEY, CITY HALL, WORCESTER, MASS.

All bills not relating to the Journal, and MEMBERSHIP DUES $2.00 *per year), should be sent to the Treasurer of the Association, DR. JAMES B. FIELD,* 329 *WESTFORD ST., LOWELL, MASS.*

OCT 27 1911

EDITORIALS.

THE REGULATION OF THE MILK SUPPLY OF GREAT CITIES.

So long as health authorities concerned themselves entirely with the chemical purity of milk there was little real difficulty in deciding what restrictions should be enforced. No one protested against the rule that milk should not be skimmed or watered. The use of disinfectants was defended by few, and even the addition of harmless substances to make the milk appear richer was objected to by most as a fraud.

When it came to be recognized that the transmission of scarlet fever, typhoid fever, diphtheria and tuberculosis through milk was not infrequent and that an unadulterated but dirty milk excited dangerous diarrhoea in infants it became apparent that conditions on the farms, the methods of shipping and the bacterial contents of the milk must be looked into, since they were of even more importance than the substitution of water for milk or the addition of gelatin to cream.

What has seemed essential to protect the consumer has frequently conflicted with the interest of the producer or imposed too much cost on the city. All who have been interested in the milk supply of cities will admit that it is a most difficult matter to decide how pure and well inspected a milk supply it is wise to attempt.

The great territory from which the milk supply of large cities is taken adds to the difficulty of carrying out proper regulations.

Conditions at the farm can only be properly learned through inspection, and the city or state should employ enough inspectors to visit each farm at least once during the year. If this visit is made at an unexpected time, or when a complaint is received, it will create a wholesome fear among the slack, especially if severe penalties are inflicted when grossly improper conditions are discovered.

It is generally considered by bacteriologists that the most serious contamination of milk is through the addition of the contagion of scarlet fever, typhoid fever and diphtheria. Tuberculosis is also known to be carried by milk. Next in importance are the bacteria derived from diseased cattle, such as those suffering from inflamed milk ducts, enteritis, or sepsis. These bacteria are indeed deleterious, but not as a rule capable of transmitting diseases beyond the one drinking the milk. The ordinary bacteria of milk, which are derived from the cow manure, hay dust and other sources, are even less harmful, and only render milk distinctly dangerous to infants when in considerable numbers, and even then chiefly because of the chemical changes they produce.

The city should insist absolutely that the officer in charge of milk inspection should be notified when a case of suspected typhoid fever, scarlet fever or diphtheria occurs on a farm supplying milk, and that no person coming in contact with such cases should have anything to do with milking or bottling the milk.

It should also demand that the water used in the milking room and barn be above suspicion. A decently clean condition of the barns, cows, milkers and dairy rooms should be insisted on.

The question as to whether tuberculous cattle should be allowed to supply milk to cities is one of great importance, and is also a very difficult one to answer. There is now no doubt that bovine tuberculosis is transmitted to children. It is, however, extremely probable that the percentage of tubercular children infected in this way is small. Cattle having appreciable tuberculosis of the udders are the most dangerous, and those having pulmonary tuberculosis the next. There can be no doubt that such cattle should be destroyed, both because of their danger to children and perhaps adults, and also because of their danger to other cattle. The majority of farmers would agree to this. The difficulty is to decide what is to be done about cattle which have very slight tubercular lesions, which can only be detected through the tuberculin reaction or autopsy. At present 20-30 per cent. of cows have such tuberculosis. Probably more than half of these never develop appreciable lesions. The farmer strenuously objects to having them killed and he has succeeded in impressing his opinions on others, so that at present almost no restriction is placed upon the sale of milk from tuberculous cows.

For the sake of the cattle as well as the men, this is not a desirable condition. The health authorities in cities should definitely state that so soon as practicable they will insist on milk from cattle free of tuberculosis. One possible means to this end would be to insist on the tuberculin test of all herds supplying the milk. Those that reacted, but showed no physical signs, would be left until their milk decreased to a point where the cow was unprofitable. It would then be sent to the butcher the same as any other cow, and if the carcass passed a thorough examination it would be sold as food; if not, it would be utilized for other purposes. Many farmers make a practice of sending their cows each year to the butcher, instead of holding them over. They consider it the most economical method for all except high grade cattle. Of course the fact that these cattle have reacted has in no way made them tubercular. The test has revealed it, and they are no worse for food than they were before being subjected to the test. In this way all tubercular cattle would be eliminated in a year or two, and no more would be used for food than at present.

Another matter that needs regulation is the temperature at which milk is kept. The cleanest milk when kept at a high temperature soon sours. After much investigation a temperature of 50 degrees Fah. has been decided to be low enough to keep the milk bacteria from increasing rapidly, and one easily maintained by the farmer, railroad and dealer. In some cities, as New York, for instance, last summer large quantities of milk were dumped in the gutter because the temperature was found to be five or more degrees above the limit set. Some objected that much of this milk was good. That was true, but the point was it would have been better if it had been kept cool, and there was no way of enforcing a necessary and reasonable law except by making examples of those who wilfully tried to break it.

The difficulty of procuring funds enough to employ sufficient inspectors to look after the production and shipping of milk has caused the laboratories to try and devise means which will detect errors.

Thus the number of bacteria in samples of milk is estimated. Some cities make it illegal to sell milk containing over 500,000 bacteria per c. c. This regulation is made because there is no excuse for milk containing on the average 500,000 bacteria. It must have been produced in a filthy way, or shipped warm or be very old to have this number. It is true that such milk would not harm an adult or when sterilized seriously injure the average infant but it is decidedly worse than it should be, and, if produced so carelessly, it is probable that it would not be safeguarded from the germs of the contagious diseases of man or cattle. Another test reveals under the microscopic pus cells and streptococci, and thus indicates that the milk of diseased cattle is being sent.

The bacterial count and the microscopical examinaton are thus detectives ready to point out unhygienic methods. For a similar purpose samples are taken by the chemist, and thus the extraction of cream, the addition of water or the use of formaldehyde and boric acid are discovered.

The fact that it is impossible at present to provide a great city with as safe and pure a milk as is desirable has started a movement to make accessible to all a very pure supply, which is produced and handled by the best kown methods. As a rule, a society of physicians works in connection with the Health Department of the City and through trained inspectors supervises the production and sale of the milk. It guarantees the purity of the milk and its freedom from excessive numbers of bacteria and from all disease bacteria.

The farms supplying this milk act as examples to all adjacent farms and help to raise the general standard. Over 10,000 quarts of such milk are being produced daily.

W. H. PARK.

PLUMBING REFORM.

The object of plumbing, as the word is here used, is the speedy removal of various well-known wastes from houses and other buildings. Their removal is demanded by health and convenience, although in the minds of most people the order is reversed. As a matter of convenience, no one is greatly concerned about the method of removal so long as it is speedy, complete and reasonably cheap. The same might be said from the health viewpoint, were it not for the belief that the exit for the wastes may become an inlet for harmful gases and, as many still think, for various disease germs. Extremists even go so far as to speak of defective plumbing as "a breeding place for all manner of disease germs."

The early alarms over so-called sewer gas, combined with the later fears that arose with the adoption of the germ theory of disease and its relations to house sewage, led to the development of many and diverse traps and a forest of vent and back vent pipes that might well have been the despair of all sane men except plumbers, and which were a sourc of trouble and grave doubts to the most sensible and honest of that craft.

Many cities and towns, including some that one would least expect it of, are still enforcing or trying to enforce plumbing ordinances drawn in the days when "sewer gas," trap siphonage and "breeding places for disease germs" were still the nightmare of most persons who pretended to be posted in household sanitation. But fortunately for the public health and the private pocketbook a respectably large and a constantly growing number of communities and individuals now realize that a plumbing system greatly simplified as to traps and back vents lessens rather than increases the dangers, both imaginary and real, of house plumbing, besides effecting economies which make possible better material and workmanship for the really essential parts of the plumbing system. Ventilation is still thought well of; in fact, so well that main or running traps are being omitted on house drains and thus the house and the street sewer, as well as the house piping, are being ventilated through soil pipes and their extension to and through house roofs.

Among the reasons, not already suggested, for these changes in opinion and practice is the growing acceptance of evidence that disease germs are rarely disseminated through the air of sewers and house plumbing systems; that the air in soil and waste pipes, as a rule, is as bad as or worse than that in sewers; that if only ample ventilation of both the house piping system and the public sewerage system can be afforded by omitting main traps and ventilating through the soil pipes and their extensions there will be little foul air in sewers, and particularly in well constructed and operated modern sewers; and that through air currents and otherwise back venting pipes are liable to aid more than retard the loss of water seals in traps.

The modern art and science of plumbing makes for simplicity, solidity, accessibility, good material and workmanship, and the fewest possible joints. The best plumbing and sewerage together aim to remove all wastes before offensive decomposition can begin, to reduce to a minimum the number and size of places for the deposit of organic matter and to still further reduce such deposits as do occur by flushing and cleaning, and finally to provide such ample ventilation as will prevent the accumulation of foul odors in public and private sewers and in house plumbing systems.

I have not written of the details of plumbing work and fixtures because they are generally well understood by the best sanitarians and plumbers. The underlying principles of modern plumbing are also pretty generally understood by the most progressive sanitarians and plumbers, but unfortunately many local boards of health are still composed of or controlled by men of the old school, who gained their ideas of plumbing and the other older branches of sanitary work when filth and vile odors were supposed to be the sources of disease and air the chief means for its spread. We now realize, or are beginnings to realize that the individual is the source of communicable diseases and that such diseases must be suppressed at their source. The day will come when comparatively little disease-infected waste matter will find its way into the sewers without first having been disinfected and when all our sewage wastes will either be purified or else discharged into bodies of water where they can do no harm—in either case being conveyed from the plumbing fixture to the point of treatment or other disposal so expeditiously and perfectly as to subject no one to risk.

M. N. BAKER.

WATER FILTRATION VERSUS WATER PURIFICATION.

A casual comparison of the water supplies of our leading cities with their respective typhoid fever death rates will show that water filters and typhoid epidemics have existed in some of our municipalties at the same time. Indeed, examples of this may be had with little seeking.

In England as in the United States, the annual high-point in the typhoid morbidity is during the fall, while in some parts of London it occurs in the middle of the winter. Corfield has shown that the London epidemic occurred whenever the operation of the old-fashioned, open-flow filters was interfered with by the accumulation of ice, which tended to prevent the proper cleansing of the filters and therefore reduced their bacteriological efficiency.

The filters at Altona, which in 1893 protected the city against the cholera epidemic which scourged the adjoining city of Hamburg, failed to purify the water during the winter of 1894 because the sand surfaces became frozen while the filters were being scraped, as the result of which loss of efficiency Altona suffered an epidemic.

In St. Petersburg the filters were not adapted to the character of the filtered water, and during times of high turbidity the quality of the effluent deteriorated, and on one occasion at least an epidemic was traceable to this cause.

In the United States previous to 1895, the introduction of water filters was not as a rule accompanied by a marked reduction in the typhoid fever death rate, although there were notable exceptions at Lawrence and a few other well-remembered places.

Several epidemics have followed the interruption of filtration for the purpose of making repairs to or changes in other parts of the water works, thereby permitting unpurified water to be supplied to the consumers for a longer or shorter period. The epidemic at Butler, Pa.,—the greatest on record—is a case in point. This city was supplied with unfiltered polluted water for about two weeks, during which time the seeds of the great epidemic were sown. Butler grew very rapidly, which made frequent changes in the pumping machinery necessary. The filter plant was shut down while connections were being made with new pumps.

Many of the failures of filters have been where mechanical filters have been used with insufficient coagulant. Many of these mechanical filters were installed solely for the purpose of removing turbidity from the water. Later on the unfiltered water became polluted and filters designed and operated as clarification plants were inadequate as purification plants.

We have multiplied these examples to illustrate how essential it is that the purification of all water supplies be continuous, day after day. A corollary to this is that a water supply which is dangerously polluted at any time should be purified all the time.

To accomplish continuous purification, three things are necessary,—proper design, proper construction and proper operation.

For a time there was a great deal of controversy over the comparative merits of slow and rapid or mechanical filters, the latter using sulphate of alumina as coagulant. At present, however, it is quite generally conceded that each system has a field of its own in which the other is not efficient, and that in other fields either may be employed. It is essential, however, in any case, that when necessary the water be properly treated by means of sedimentation or other processes before being subjected to filtration. The selection of the type and its adaptation to the water to be treated is the work of the sanitary expert and engineer, and consequently must be well done if good results are to be obtained. He should be careful to design a purification plant with sufficient reserve for all conceivable emergencies, just as he would provide an adequate reserve supply for fire protection.

However, even the best designers and constructors cannot insure the proper operation of a purification plant. This depends upon the manager of the plant; therefore it is of paramount importance that he be conscientious and well trained,—if possible, one who has a knowledge of sanitary chemistry and biology, but above everything else, a man of character, capable of shouldering responsibility. To those who say that such men cannot be obtained, we reply that the railroads are quite successful in securing such men for the responsible positions of train dispatcher, engine driver and tower man.

There is no great difficulty in getting men competent to operate pumping engines costing upwards of $100,000, and it is believed that the water departments can procure the same class of servants for the operation of water filters. They may demand higher wages than those of many men now in charge of filter plants, but we are sure that parsimony along these lines militates against the continuous and efficient operation of water purification plants, and therefore against the public health.

The attainment of the results described above is quite possible: in fact, they are realized in perhaps ten per cent. of the urban population of the United States, and might be in at least sixty per cent. of the population now supplied with water of questionable quality.

R. S. WESTON.

DEATH RATE FALLACIES.

In the way of hygienic news the steadiest demand is for statistical small beer. Weekly summaries of mortality are supplied with clockwork regularity. The daily papers welcome them, and the editors of weekly medical journals would be shocked if the supply of this sort of "copy" should be cut off. When the total mortality for a given week is divided by the estimated population for some other week and the quotient multiplied by the number of weeks which do not make a year, or by the factor 52.14, or by 52,28, in order that the answer may be compared with the strabismic answer to a similar operation in the "corresponding" week last year, thoughtful people may well ask, "What's the use?"

Greater New York has figured a death rate for 1904 of 20.32 per 1,000. It is suggested that New York has estimated her population too low in 1904. It is just as easy to figure too high a population, and the results are more satisfactory. The death rate in 1900 was 20.56; in 1901, 20.02; in 1902, 18.74, and in 1903, 18.18. The evidence of the past five years appears to indicate that New York has twice figured too high a population and three times too low a population, or, leaving the Census year out of the account, that the estimates are just as likely to fall short of as to exceed the true population, and therefore testify to the good faith of the estimaters. The progress of municipal sanitation has deprived annual death rates of much of their significance. Large sanitary works, with social and industrial progress, have given to the life history of modern cities a certain stability, releasing the health officer from his anxious scrutiny of the annual death rate, and permitting him to be concerned chiefly with the particulars of current mortality and with the special hygiene of preventable diseases. When the death rate of Greater New York makes an excursion of two points in a year, three possible explanations are to be thought of—a glaring phase of mortality, a glorious assault upon some agency of death or a slip in arithmetic.

In the last number of this Journal the writer remarked upon the unique skill of the Chicago registrar in determining the causes of death. In 130,000 consecutive instances not one death failed to be recorded under a known cause. The explanation is perhaps furnished by Mr. Samuel Hopkins Adams in his recent excellent study of tuberculosis, published in *McClure's* for January, 1905. Mr. Adams says that Chicago physicians do pretty much as they please in respect to notifications of all sorts, and that the Health Department depends for information concerning causes of death more upon undertakers than upon physicians. Of course clear and positive statements concerning causes of death are of first importance in mortality registration, and such statements are more easily obtained from undertakers than physicians. In the matter of diagnosis the undertaker is free from the scientific skepticism which sometimes embarrasses physicians.

The mortality reports of undertakers are in one respect generally better than those of physicians, for the undertaker can always testify as to the fact of death, while the physician often certifies without having ascertained that death has indeed occurred. Some two years ago a London physician was called at night to a medical student, who appeared to be extremely ill, so ill indeed that the physician was not surprised to hear in the morning that the young man was dead. A stranger called upon the doctor, and, stating that he was a brother of the deceased student, asked for a certificate of death, which the doctor forthwith furnished. It presently transpired that the sick student and the bereaved brother were one and the same individual. The motive of this remarkable impostor was to defraud an insurance company.

JOHN S. FULTON.

JANUARY ANNUAL MEETING

OF THE

Massachusetts Association of Boards of Health.

The annual meeting of the Association was held at the Brunswick Hotel, Boylston Street, Boston, Friday, January 27, 1905, with luncheon at 1 o'clock P. M., with Dr. Walcott, President of the Association, in the chair.

The Chair appointed as the committee upon nominations for the ensuing year, Professor Sedgwick, Dr. French and Dr. Palmer.

THE PRESIDENT: It will be remembered by the Association that since we met here at an annual meeting, the Second Vice-President of this Association, Dr. Samuel W. Abbott, has died. He had been in your service since, I think, the beginning of this society. He had served here, and he had served everywhere, faithfully, quietly and successfully. It is moved that a committee be appointed of this Association to prepare resolutions to be entered upon the proceedings of this Association. Is it your pleasure to appoint such a committee? If so, will you signify it by saying aye?

(Response, "Aye.")

The President: How shall that committee be appointed?

(Response, "By the Chair.")

The President: The Chair will then appoint Dr. Emerson of Springfield, Mr. Coffey of Worcester, and Mr. Newcomb of Salem, to prepare the resolutions.

Your Executive Committee recommends for membership in this Association the following named gentlemen: Alexander M. Wilson, of Brookline; Dr. Carroll H. Idam, of Lawrence; Dr. Albert S. Whittemore, of Boston, and Mr. W. H. Hemenway, of Brookline.

(These gentlemen were duly elected.)

The President: The report of the Treasurer is now in order. Dr. Durgin, I understand, will read the report of the treasurer.

Dr. Durgin: Our treasurer, Dr. Field, is unavoidably absent today and has asked me to read the following:

ANNUAL REPORT OF THE TREASURER FOR 1904.

Receipts:

Balance from 1903 in the Savings Bank	$945 39	
In the National Bank	123 85	
Total,		$1,069 24
Received for annual dues for 1903	$14 00	
Received for annual dues for 1904	472 00	
Interest from the Savings Bank	38 18	
		$524 18
Making a total of		$1,593 42

The expenditures are as follows:

Publishing the Journal	$276 00	
Index to the Journal	56 10	
Printing	45 60	
Postage	44 95	
Clerical assistance, partly for 1904,	33 80	
Cigars	32 38	
Treasurer's bond	4 00	
Total		$492 83
Balance to 1905		$1,159 00

Respectfully submitted,

James B. Field, Treasurer.

The Treasurer has sought to get this audited, but the auditor has been too busy. I move that this report be accepted when audited.

The President: It is understood that when this report has been properly audited it will be accepted and placed on file. Dr. Durgin has a resolution which he is to read to the Association.

Dr. Durgin: I bring this resolution in consequence of a movement in the Metropolitan District of Boston and vicinity to suppress a smoke nuisance. It was thought that this Association would be an appropriate body to endorse this movement.

Resolved, That this Association of the Municipal Boards of Health of the Commonwealth of Massachusetts have noticed with satisfaction the measure brought before the legislature for the abatement of the smoke nuisance in the Metropolitan District of Boston and vicinity, and will gladly assist in any reasonable measure for relief from a nuisance and injury to health, everywhere recognized as such by all sanitary authorities.

(The resolution was adopted.)

THE PRESIDENT: It is a rather interesting fact, and I think a most encouraging fact, for this Association, that we have in successive years derived so much help from scientific men who are not physicians, and that medicine has at last, so far as public health questions go, called in all the resources of science, for they are all subsidiary to the great interests we have at heart. It is rather interesting, in noticing the title of Dr. Morse's paper, that the gentleman who is known in this community for his life-long friendship for the Japanese people should now be speaking to us on the subject of noise, when that particular people is creating more noise than any other collection of human beings on the face of the earth. (Applause.) Dr. Morse.

ABSTRACT OF PROF. MORSE'S PAPER ON "NOISE."

(Professor Morse was permitted, at his request, to publish his paper elsewhere, in advance of the date of issue of this journal. An abstract only is therefore given here.)

Professor Morse quoted a large number of experts concerning the injurious effect of noise, amongst whom were Dr. John H. Girdner, who says that "Noise plays an important part in producing neurasthenia"; The Journal of American Medicine, which condemns locomotive whistles as a menace to public comfort, health and sleep; the Philadelphia Medical Journal, which insists that American cities are pandemoniac under avoidable noises; Dr. Walter Kempsler, Health Commissioner of Milwaukee, who also strongly condemns locomotive whistling; the Philadelphia Medical News, Dr. Ernest J. Lederle, Dr. Walter B. Platt, and Dr. William Thomson, who severally condemn the prevailing city noises in the strongest terms.

Professor Morse then treats of the ordinary city noises.

First. As a nuisance: Political posters set up in Pompeii, 1,900 years ago, have been unearthed, showing that the principal platform of certain candidates was the suppression of street noises.

Second. As to attempts at amelioration, quoting the substitution in Belgium of soft-toned for screeching locomotive whistles, and referring to certain noiseless switching engines installed by the New York Central.

Third. As to depreciation of real estate by noises in the neighborhood, quoting various instances.

Fourth. As to the indictability of those responsible for noise, quoting recent decisions of the Superior Court of Massachusetts, allowing damages for noise caused by the Elevated Railroad.

Fifth. As to the necessity of certain noises, quoting relief obtained by protests to the Railroad Commissioners in cases of whistling for crossings, and other whistles, in Waltham, Belmont, Salem, Peabody, Franklin, Reading, Lowell, Southbridge, Malden, Medford. Woburn, Bradford, Concord, Melrose, Ware, Northampton, Arlington, Lawrence, Hyde Park, Brookline, the Newtons, and other places. He points out that if relief can and has been secured in these places, there is no reason why it should not be secured in all.

Sixth. Can the steam whistle be suppressed? Both locomotive and stationary engine whistling has been stopped in a number of cities—Cleveland, Atlanta, Newcastle, Pa., and in England. The address was extremely witty and eloquent, covering the ground thoroughly, in a manner impossible to reproduce in any way in a brief abstract.

The President: The next paper is upon "The Effect of Noises Upon Weak and Nervous People," by Dr. Philip Coombs Knapp. I now have the pleasure of presenting Dr. Knapp.

THE EFFECT OF NOISE UPON WEAK AND NERVOUS PEOPLE.

BY PHILLIP COOMBS KNAPP, M. D., BOSTON.

At irregular intervals the sensational journalist, who has no degree of comparison but the superlative, and no knowledge of anything that has been said or done before yesterday's edition, informs us that the enormous increase of nervous diseases which he assumes to exist is due wholly to the excessive amount of noise attendant upon the processes of modern city life. It is, perhaps, hardly necessary to consider his assertions seriously, or to attempt to refute them; but it is of course plainly evident that many of the noises of the city are unnecessary and could be dispensed with without other detriment than a slight expenditure of money. The gongs and horns of the trolley-cars, the fire department, the bicycles and the automobiles are necessary as a protection to the traveller, although their noise might be modified and lessened; the hucksters' cries, the clatter of steel rails in transportation, the toy pistol, the factory whistles, and the old nine o'clock bell are needless, and may well be eliminated, although to do so might mean a pecuniary loss to certain individuals.

The three great sensory conductive tracts, the visual, the auditory and the tactile, are in a state of constant stimulation during our waking hours throughout life. This constant stimulation is never attended with exhaustion, and is so much a necessity of life that consciousness would cease without it, motion would become impossible, and the centrifugal motor nervous apparatus, if deprived of its sensory stimuli, would atrophy. The sensory stimulus, whether through the eye, the ear or the skin, is a physiological, harmless, necessary process. If the stimulus become excessive, the sensory apparatus, especially in its peripheral receiving apparatus, may suffer. Deafness may result from constant excessive noise, producing affections of the inner ear and auditory nerve, as is common with boilermakers; and visual impairment may follow exposure to extreme degrees of light, as in snow blindness. In so far, then, as noise becomes excessive it may tend to impair the hearing of the healthy man; but this impairment of hearing by itself does not seem to lead to any other disturbance of the nervous system.

When we call to the aid of our ordinary sensory perception that higher faculty of attention or apperception, we introduce another factor which seems to be of some influence. The exact mechanism of attention is obscure, but it is ordinarily attended with certain motor muscular activities, the contraction of the eye-brows, the compression of the lips, a certain stiffening of the muscles of the throat, a contraction of the aural muscles, and the like. As a result of these motor manifestations, or from some other cause, continued attention is sooner or later followed by fatigue, while the ordinary sensory perception without attention is attended by no fatigue whatever. The greater the attention, the sooner comes fatigue. Listening attentively, therefore, is often fatiguing; and with partly deaf people, who have to pay close attention to ordinary conversation to understand what is said, the effect may favor the development of a pathological fatigue or neurasthenia. In the same way, much greater attention is required to comprehend what we hear, if there is excessive noise. It is natural to expect, therefore, that fatigue would be more readily produced in those whose occupation requires intelligent listening under such conditions—the teacher, the stenographer, the student at his lectures, and the like. The noise increases the effort of attention and leads more readily to fatigue.

Finally, noise may have an influence in the healthy man in disturbing sleep. Sudden and unusual noises will inevitably wake the sleeper if they be loud enough, although some persons can accustom themselves to sleep in the noisiest surroundings. Many healthy persons, however, are light sleepers, and noise thus is often a serious detriment in diminishing the individual's ability to get the requisite amount of sleep.

Noise, therefore, may be harmful to the healthy person by increasing the liability to fatigue, by requiring increased attention and by diminishing the amount of sleep. In some cases, if excessive, it is further harmful by producing deafness.

When we come to deal with sick persons, the effect of noise is, of course, intensified. The typical "nervous" patient in the eyes of the laity is, of course, the neurasthenic, but many other persons of a neurotic type have many of the characteristics of the neurasthenic, even if they can not be classed strictly under that head. Furthermore, almost every sick person, whatever be his disease, is asthenic, and his nervous system usually shares in that weakness, making him to a greater or less degree neurasthenic. All these persons are in a state of chronic pathological fatigue. The majority of neurasthenics and many of the neurotic class are poor sleepers. They are, furthermore, in a state in which fatigue is much more readily induced or increased than under normal conditions. They are also often hyperaesthetic in some or all of their sensory functions, so that a very slight stimulus may produce much more effect than in health. They resemble Hans Andersen's princess, who felt the pea under twenty mattresses and twenty feather beds. In these persons, therefore, from their increased excitability and their more easily induced fatigue, noise may be much more injurious than it is in health, and may intensify their disease.

There is another element in noise, beside its intensity, an element whose effect is much more variable and far less readily estimated, and that is its quality. It is held by many psychologists that every sensation is attended by an affective quality, pleasing or displeasing. Whether this be universal or not, it is certain that many noises have, primarily or secondarily, a displeasing quality, which varies with the individual or with certain conditions. The filing of a saw, for instance, is primarily disagreeable to the vast majority of persons. Hiawatha or the Good Old Summer Time becomes maddening after we have listened to it for several months, and the pop of the champagne cork arouses disgust only on the morning after. As we advance in education, sensitiveness and refinement, many sounds become unpleasant which are tolerated or enjoyed by the child or the savage, and thus constitute a source of annoyance.

We have seen that ordinary sensory perception is a normal physiological process, which goes on continuously, without nerve exhaustion. If this perception be attended with emotional conditions, involving pleasure or pain, exhaustion is sooner or later produced, according to the intensity of the emotion; just as exhaustion follows the process of attention. To the healthy man the unpleasantness of the wheezy hand organ, the concert of cats on the back fence, or the squawk of the "devil's fidde" that swept this region like an epidemic in the early seventies, is an annoyance which hardly rises to the dignity of an emotion, yet which may facilitate fatigue. To the hypersensitive neurasthenic and neurotic, and to all hypersensitive invalids, such annoyances may become so great as to be positively disturbing and intensify all their troubles.

Noises of too great intensity, therefore, may be injurious to health by interference with sleep and by facilitating the onset of fatigue; noises of unpleasant quality may be irritating and annoying and thus render life more unpleasant and increase fatigue. The civilized community will restrict not only everything which impairs the health, but everything which is disagreeable to a considerable number of its members. We have not yet attained that standard of true civilization.

The President: The next paper is upon "Some Considerations Concerning City Noises," by Prof. James J. Putnam.

"SOME CONSIDERATIONS CONCERNING CITY NOISES."

BY PROF. JAMES J. PUTNAM, BOSTON.

In studying the problem of noise with such data as my experience and general information has furnished, I have been forcibly struck at finding two classes of facts which seem to stand in contrast with each other. Thus, we find, on the one hand, persons who suffer acutely from noises, especially noises of certain sorts, and many whose sensitiveness thereto seems to increase rather than diminish as time goes on; while, on the other hand, there are persons also who seem to get not only relatively but absolutely habituated to noise, or, to speak perhaps more correctly, whose power of concentration makes them oblivious to the disturbances of every sort by which they may be surrounded.

As an example of the first class of persons, I would mention the case of a lady of great intelligence, although also a great invalid, and in some respects of highly nervous temperament, who for many years was such a sufferer from noises that she sent out and had all the crickets killed upon her country place, and would gladly have induced the authorities to remove a distant siren, stationed as a warning to vessels on a dangerous shore, if the public safety had permitted.

No one unfamiliar with the sensitiveness of nervous patients can easily conceive how much greater are their sufferings in these respects than the sufferings of persons in ordinary health.

As an example of the second class, I will refer, as a counterpart to the celebrated instance of Archimedes, who continued to work out his geometrical problems on the sand, oblivious to the assault and taking of the city—to the case of a personal acquaintance, who can write and study in his library in positive ignorance whether his daughter has been playing the piano in the meantime or not, and who, in general, so loves the city sounds that, on returning after an absence, he declared he wished for nothing so much as for a chance to stand in Dewey Square and hear the rattle of the express carts and the thunder of the passing trains.

If all our citizens belonged to this latter class of persons, the problem before us today would cease to be of practical interest. This is, however, far from being the case, and the questions which especially interest me in this discussion are the following:

1. How far can habituation practically be counted on as a means of relieving the distress suffered by most persons,—the average person, we might say,—from the distressing and injurious effects of noise?

2. Is this process of habituation, when it occurs, apt to be attended with unfavorable results?

3. What are the conditions which especially interfere with a favorable habituation, and which ought, so far as practicable, to be eliminated?

1. As regards the extent to which habituation ordinarily goes, I believe, in the first place, that the experience of most of

us here, who have, presumably, fair health, and are engaged in more or less literary pursuits, is not equivalent to that of the gentleman above cited. Most of us cannot read and study, or do the sort of work as falls to the share of accountants in city offices or clerks in city stores, who have to cast up accounts and consider the problems of possible customers, with the same comfort and precision as in the midst of quiet. Lawyers and business men seek elevated and distant rooms for their offices, where they can talk, think and labor undisturbed. An architect friend keeps his office window closed, even in summer, on account of the difficulty of working in the midst of the street noises. It is true that the operatives in mills and the drivers of express teams and dray-carts acquire, in many cases, a considerable immunity, so that, for example, the tenders of looms, who spend their days amid the deafening roar of the cotton mill, are said to be able to converse with each other without special labor. But it must be remembered, first, that the work that they perform does not, as a rule, require much flight of thought, or consideration of new problems, and, next, that the noise to which they are subjected is uniform and continuous, which, as I shall try to show, is a consideration of importance. Last, but not least, no one has sufficiently estimated the sufferings which they actually endure. With weak and nervous persons, such as Dr. Knapp has been considering, habituation often fails to occur at all, and the strain of noise and tumult, up to a certain point, at least, is one of progressive increase.

Habituation may, then, be counted on as perhaps thoroughly effective with persons of strong nerves and unusual powers of concentration, and under conditions which are especially favorable; it is only moderately effective with persons of ordinary health and living the ordinary lives of the hard-working citizen; with delicate persons, and especially with the large class of more or less fatigued persons, who, for one or another cause, have a nervous dread of noise, habituation is not effective at all.

2. As regards the question whether attempts at habitua-

tion are liable to be attended with unfavorable results, I have a strong impression, almost amounting to a belief, that the grade of work which is done under the influence of city noise is usually inferior to that done under relative quiet, and that the standard of the work which might be done becomes gradually lower. It is true that most persons can work satisfactorily, and often to even better advantage, while listening, though without particular attention, to continuous and pleasant sounds, such as those of music, or even of the distant hum of city sounds, when heard, for example, from the distance of a pleasant office on an upper floor of a tall building. Under such conditions these external sounds may be just enough to gather up the wandering rills of thought, which, in the midst of an absolute quietness, such as that of the country hillside, might intervene to disconcert the main current of attention. But this is far different from doing good mental labor under the distracting conditions of tumult which beset many of the workers in our large cities. If this opinion is correct, a corollary of practical importance must, I think, also be admitted, namely, if the work done under these conditions is less good the nervous strain of attempting it must be more severe, and more likely to be attended with injurious effects upon the health. For both of these reasons, a reasonable degree of quiet ought, so far as practicable, to be secured for all persons of whom good work, implying concentration, attention and interest, is to be required.

3. As regards the question what the conditions are which make a satisfactory habituation more difficult, I would offer the following considerations: (a) Intermittent noises are far harder to bear than continuous noises. A gentleman of my acquaintance, who found himself obliged to spend some nights on Boylston street, near the crossing of the Albany railroad, and with electric cars frequently passing, actually set up an electric fan in his room so that he might bring the habituation to a continuous noise to his aid in learning to sleep through the intermittent noises. It takes a long time to become so accustomed to the crash of occasionally passing trains to such an extent

that they do not seriously inerrupt the flow of passing thought. An inhabitant of a country town, into the main street of which, hitherto the abode of absolute stillness, electric cars had recently been introduced, declared that they seemed to him to be tearing up the very roots of the trees in passing. Even persons who live in the neighborhood of loud chimes, although good in themselves and well-played, like those of the Church of the Advent, are very much annoyed by them, whereas the inhabitants of foreign towns, where the great cathedral bell is almost in constant service, are supposed, at least, not to be disturbed by the sound. One reason which has been adduced by certain persons for objecting to chimes is that they are doleful and call to mind distressing thoughts, as of sadness and funerals. Perhaps with the great majority of persons this consideration is unimportant, but I will use it for the sake of calling attention to another point of practical significance, namely, that we endure better the sounds which suggest enterprises with which we are in sympathy than we do those suggesting enterprises to which we are indifferent or adverse, It is partly for this reason that the ardent lovers of civilization, especially of civic life, more easily endure the racket of the town, and that those who love to see demonstrations of cheerfulness and activity like the street bands and hurdy-gurdys, even when the instruments are out of tune. We endure, as a rule, the noises made by our own children better than those made by our neighbors', until, through philosophic reflection, we regard our neighbors' children as our own. I have frequently attempted to make use of this principle in training sensitive persons to a greater disregard to the noises by which they were surrounded, and I believe that this attempt should be made more frequently than it is. Thus, I have recently had the care of a nervous patient, lying in a room at the Massachusetts General Hospital opening on a ward corridor, which was free from many of the hospital noises, but where a number of children were playing about and perhaps occasionally indulging in tears. In the next room lay another patient, coughing from acute bronchitis. The patient of whom I speak began by suffering acutely and increasingly from these disturbances, which prevented sleep and kept her nerves on edge. I told her she must get over them by imagining the children as her own and the coughing patient as a member of her family, or, at any rate, by thinking of herself as playing with them and entering into the spirit of their game, or as occupying the position of a nurse. Fortunately, the suggestion proved acceptable, and very soon the patient herself admitted that she had become indifferent to the disturbance.

Again, it is much harder to become accustomed to noises associated in the mind with ideas or memories of an unpleasant and, especially, a terrifying sort, and this is, I believe, one reason why the whistles, the bells and the earth-shaking of approaching trains is with difficulty endured, especially at night.

The harsh and often thoughtlessly sounded gong of the bicycle is another case in point, and I would gladly see this nuisance abolished and the burden of avoiding a collision thrown wholly upon the rider.

All persons, then, whose work requires attention, concentration and judgment should be secured a chance to work, so far as practicable, without being forced to habituate themselves to loud noises, near noises or intermittent noises; the fact should be borne in mind that a considerable proportion of city workers are under more or less fatigue and strain and are therefore apt to be sensitive to noise, and that with this sensitiveness there often goes a higher standard of mental and emotional efficiency.

As regards the matter of habituation, and the question whether insidious harm is not liable to attend the process, I would call attention to the analogous case of the habituation to the effects of impure air. It has, namely, been well proved, both by experiment and observation, that persons who have been exposed continuously for some time to bad air feel the effects thereof apparently less than persons who are suddenly introduced into it from a pure atmosphere. Yet no one, I presume, doubts that in the first case as well as in the second injurious effects occur.

It has passed too long for sound doctrine that the senseless clangor of July 4th, the needless shrieking of the locomotive and the fatiguing racket of the streets are nuisances which the good citizen should endure in silence.

THE PRESIDENT: These very interesting papers, upon this most important subject, are before you, gentlemen, for discussion. Prof. Sedgwick, we would like to hear what you have to say about this matter.

PROF. W. T. SEDGWICK: Mr. President and fellow members, I am exceedingly glad that Prof. Morse has come in here and given us his ideas on a subject which he has studied for a long time and about which he has felt very deeply. He has kept watch of this thing for a number of years, and yet, to show how different the opinions of excellent people are in matters of this line, I may say that on one occasion, in talking with Dr. Henry Bowditch about the cleaning up of our streets, he took a very optimistic view and had said: "Well, I suppose that pretty soon the cities will become the nicest places in the world to live in; we shall have better water than in the country; we shall have better food protection; we shall not be wetting our feet; the cities will be ideal places to live in." I had assented more or less, and went on to my office. In opening my mail I found one of Prof. Morse's papers which was entitled, "Can City Life be Made Endurable?"

Nothing is more striking in these days than that city people are generally fatigued. They are fatigued all the time. "That tired feeling" which is referred to in quack advertisements is found not only in the country but in the city. When vacation time comes and the city man goes into the country, he sometimes cannot sleep because of the lack of noise. This may show that he has been habituated to the noise, but it seems to me that it shows a good deal more, namely, that he is in a very abnormal pathological condition, from any high standpoint, and I believe that one of the great problems of cities is to control noises in order to make the cities more habitable. You and I can stand these noises as we say,—or, at least, we do stand them, although we prefer not to. A man can say that he can live amid clanging bells and shrieking whistles and be happy at the same time, and so he can if he is strong and well; but there are many delicate people who are just as much entitled to the rights of life and liberty and happiness as we are who are strong, and it is our duty as health officers to have a thought for those people and their welfare. If they happen to be our own friends on beds of sickness, we realize what it all means.

THE PRESIDENT: Dr. Durgin is certainly responsible for more things in this Commonwealth than anybody else (laughter), and I think we had better hear what he has to say about this subject.

DR. DURGIN: If it were true, as said by our worthy Chairman, that I am so responsible, all the worse for me. I feel vastly interested in this subject of unnecessary noise, and have taken great pleasure in listening to these valuable papers and in witnessing the interest manifested all through the audience. It makes me feel as if there may be a better day coming. For many years I have regarded noise, smoke and dust as among the great evils and public nuisances in city life, and certainly so in Boston. My sympathies have always been with those who were suffering from unnecessary noise. There was one case in particular, about twenty years ago. We tried to find a remedy for an infernal noise coming from a circular saw seriously affecting a sick person across the street, who could not escape the injury and discomfort from this noise without breaking up a valuable home. Before we realized our inability to do anything, we had more than half promised relief, but when we reached the law department of the city we were turned down, as having no jurisdiction over noise. The husband of the sufferer was then advised to take the case to court on his own motion. He did so, and lost the case. It seems to me that this is a serious condition, and we ought to find or secure an adequate law; and I hope that every member of this association will constitute himself a committee of one whose energies shall be directed and forcibly exercised upon this question.

There are many more sources of unnecessary noise than have been mentioned here today. The "din of the streets" is proverbial. Of course, a very large part of the noise in the streets is due to the rough pavement, and much is due to clattering tailboards, and sideboards of ice wagons and tip-carts, and to unsecurely loaded drays. Much of the street traffic is accompanied by unavoidable noise which can be borne without complaint, but I am satisfied that much of the noise is needless and can be avoided.

I feel intensely interested to learn who is responsible for stopping this noise. I hope that it is the State Board of Health. (Laughter.) But I am fearful that it is not there. I have strong evidence that the authority does not reside in my board, but if it does I will promise you every effort that it is in our power to exercise. I hope this Association will find out who is responsible, charge him with it and make him do his duty. (Applause.)

THE PRESIDENT: Prof. Morse has more decided ideas upon this subject of responsibility perhaps than anybody else, and very likely he can answer that question for us.

PROF. MORSE: Some years ago in the city of New York a law was passed compelling those who carried through the streets loads of iron bars to wrap them in jute. A driver, the next day after these notices had been posted warning all drivers not to carry loads of iron bars without being muffled, ignored the law and started up Broadway with one of those rattling teams of iron, and he was immediately fined $25. That stopped that noise in New York forever.

I remember the first night I spent in Berlin. I went to the hotel and was awakened at an abnormal hour by hearing the tramping of a great many horses. It sounded as if a troop of cavalry was going by. I jumped up and went to the window and looked out, and I found that it was simply the ordinary traffic of the street. The pavements were so smooth that I heard no noise from the teams, but only the sound of the horses' feet. In all the large cities in Europe you do not notice the noise of the street. Then, the streets are kept so clean. Now, if one city can keep clean and quiet, every other city can do likewise.

Dr. Durgin has spoken of the noise of a saw mill. In England the law compels objectionable noises from factories to cease on the complaint of any one who is annoyed by them. I know where they have stopped a trip-hammer and also a saw mill in the neighborhood of a family residence. That is, the rights of the citizen are respected.

What I would especially urge is that the State Board of Health should go into serious consultation with the Railroad Commissioners and insist that if the steam whistle can be stopped in thirty towns of this state, it can be stopped in all of them, even if it is necessary to modify the laws of the Commonwealth. (Applause.)

Dr. Agnes C. Vietor: I find that no one has spoken this afternoon of the unnecessary noises made in the starting of trains. A petition has been circulated in the Hotel Oxford, in the Hotel Somerset and in the apartment houses which are along both the New York & New Haven and the Boston & Albany roads, as far as they are in Boston, complaining of this thing, but I am not able to find that that petition is likely to be beneficial. I am told that it is only one of a line of petitions which have been ineffectual. It is not only the starting of the trains in the immediate neighborhood of the house, but there is the puffing of the engine which, as you probably know, continues for quite a distance from the station. I have talked with several gentlemen who have a knowledge of railroad matters, and they tell me that the causes are two: First, there is some attachment which can be applied to the locomotive which will lessen this noise, but it is not applied to the engines because it is expensive and the railroads will not apply this attachment until they are compelled to, on account of the expense. Then the second cause of the trouble lies with the engineer; he can so control the starting of the engine as to largely control the noise and diminish it. The noisy starting of the train is said to be destructive to the locomotive itself. Then, if this noise is controllable, if the engineers can be taught to diminish this noise, and if the diminishing of the noise by this proper starting of the train will save the company expense, why isn't it done?

DR. DURGIN: I want to say that we are looking for an invitation for the April meeting from some one outside of Boston. I would like to move the thanks of the Association to Prof. Morse, Dr. Knapp and Prof. Putnam for their excellent and instructive papers on the subject of unnecessary noise. (It was so voted.)

PROF. SEDGWICK: Mr. President, the Nominating Committee desires to submit the following nominations: For President, Dr. Walcott; for first vice-president, Dr. Durgin; for second vice-president, Dr. Chapin of Providence; for secretary, Mr. James C. Coffey; for treasurer, Dr. James B. Field, and for Executive Committee for two years, Doctors Emerson of Springfield, Woodward of Fitchburg, Kennedy of Lawrence, Everett of Hyde Park, and Kyte of Milton.

THE PRESIDENT: Gentlemen, you have heard the list of names reported by your committee. What is your pleasure with regard to them?

PROF. SEDGWICK: I move that they be elected.

THE PRESIDENT: It is moved that the gentlemen recommended in the report of your committee be elected as officers of your Association. If that be your pleasure, you will signify it by saying aye.

(Response, "Aye.")

THE PRESIDENT: Contrary minded, no. (No response.) They are duly elected.

Some discussion of certain phases of the internal economy of the Associaton followed, without action being taken, and the meeting then adjourned.

PREVENTIVE THERAPEUTICS.

BY HERBERT D. PEASE, M.D.,
Director of the Antitoxin Laboratory, New York State Department of Health, Albany, N. Y.

ANTISTREPTOCOCCIC SERA.—Besredka (Bulletin de L'Institut Pasteur, Tome II., Nos. 16 and 17, 1904) in a critical review entitled "Does There Exist One or Several Streptococci?" states that largely upon the answer to that question hangs all antistreptococcic serum therapy.

That the possible unity or diversity of species of streptococci has played a large role in the attempted explanations of any favorable action of the various antistreptococcic sera submitted to experimental or clinical tests, is undoubtedly true. However, a definite answer to the question propounded by Besredka would undoubtedly not settle all the clearly evident problems concerning the serum therapy of streptococcus infections.

Besredka considers the important works and studies upon the morphological characteristics of streptococci, and concludes that all attempts at classification on these differences known at present rest on a most insecure foundation.

He considers in more or less detail a number of biological characteristics, and on the basis of our present knowledge successively eliminates them as satisfactory foundations for the determination of the question he raises in the title of his article. Such characteristics included the sign of Marmorek, or the inability of streptococci of one group to develop in the filtrate of other cultures of the same group, the ability to produce a haemolytic agent, the agglutination reaction, and the preventive power and his so-called "fixation" property of antistreptococcic sera. He is inclined to believe that the use of the tests for the last named characteristic may be ultimately successful in separating groups of streptococci.

If Besredka's conclusions are correct, and they are substantiated by others, we have left, therefore, as a means of judging the therapeutic value of antistreptococcic sera for the present, at least, only the results obtained from their use in infections by these micro-organisms in man. However, the conditions under which such clinical results are obtained are so variable, and infections are so polymorphic in character, that the deductions from such observations on anything but the most extensive scale are apt to be misleading.

Recently the interest in the subject has centered chiefly on the results obtained by the use of antistreptococcic serum in those specific diseases, scarlet fever, rheumatism and smallpox, in which streptococci have been shown to be present in unusual numbers, and are considered to be either their etiological agent or the cause of secondary infections.

SCARLET FEVER.—Baginsky (Berliner Klinische Wochenschrift, 1902, Nos. 48 and 49,) believing that streptococci had an etiological relationship to scarlet fever, used Aronson's antistreptococcic serum in the Kaiser u. Kaiserin Friedrich Kinderkrankenhaus in Berlin on 63 cases of scarlet fever in doses up to 20 c. c. each. Of these, nine died, generally from sepsis, giving a fatality of 14.3 per cent. The death rate in this hospital from scarlet fever in ten years had varied from 34 per cent. to 12 per cent. The cases on which he tested the serum were severe in his opinion, and he believes the injections of the serum did much good. Their effect on the clinical symptoms was in his opinion quite marked. A closer analysis of the figures demonstrates the death rate in the injected cases to be 11 per cent. and in the uninjected 17 per cent.

Aronson's serum, such as was used by Baginsky, is prepared by the injection of horses with cultures of streptococci rendered virulent for small animals.

Moser (Wiener Klinische Wochenschrift, 1902, No. 41, also

Wiener Klinische Wochenschrift, 1903, No. 44), believing that Aronson's method of preparing antistreptococcic serum impaired its protective effect against streptococci virulent to man, used for the treatment of scarlet fever cases a serum prepared by Paltauf, by the injection of horses with numerous cultures freshly obtained from fatal cases of that disease.

Escherich (Wiener Klinische Wochenschrift, 1903, No. 23) used this serum extensively and followed Moser in using large doses.

In all he reported 142 cases treated with Moser's serum in doses varying up to 180 c. c. The effect on the clinical symptoms, he states, comes on rapidly within four to twelve hours. It consists in the relief of all the symptoms without shock or collapse. The temperature falls, also the frequency of the pulse and respiration, and the nervous symptoms subside. The serum must be given early before, or not later than, the height of the temperature and specific symptoms which usually follow the acute poisoning. The same holds true of the effect of the serum injections on the sequalae, such as otitis media, endocarditis, nephritis, etc. These are not prevented nor influenced if the serum is not given very early in the disease.

Escherich gives figures showing a diminished death rate in the St. Anna-Kinderspital of from over 12 per cent. before the introduction to 9 and 6 per cent. after the introduction of the Moser serum.

He believes the serum acts as a true antitoxic agent on account of the rapidity of its effect on the toxic symptoms. A few control tests with normal and another antistreptococcic serum have been repored, but they did not show the same strikingly favorable results.

V. Bokay (Deutsche Medicinische Wochenschrift, 1904, No. 1, p. 6) also reports the results of the use of the Moser serum in 12 cases. Single doses between 100 and 200 cubic centimetres were used, and in but two cases was it necessary to repeat the first dose.

The author obtained practically the same results as did Escherich.

RHEUMATISM.—In the treatment of articular rheumatism Menzer (Muncher Medicinische Wochenschrift, 1904, No. 33, 1461), uses an antristreptococcic serum prepared, as is the Tavel serum, by the treatment of horses with a number of cultures obtained directly from man, and not artificially enhanced in virulence.

He believes that the serum acts, not as an antitoxin, but by the stimulation of the phagocytic cells of the infected person. He claims that a healing reactive hyperaemia occurs after the injection of the serum, and that this reaction is indicative of, and necessary for, the best results. The beneficial effects which he expects from the injections are the prevention of subsequent acute attacks or the avoidance of the persistence of a chronic form of the disease, and also the prevention of heart complication.

Small doses of five cubic centimetres each were administered to 47 acute cases. Of these 45 recovered, 25 had remained well for one year, one had a recurrence and 21 were lost sight of after recovery.

Of 11 secondarily chronic cases, eight were quickly relieved and the others were benefited. Nine remained well and two were lost sight of.

Of 11 primarily chronic cases, five recovered, two were much improved and four were only partially benefited.

Schmidt (Berliner klinische Wochenschrift, 1903, No. 49, s. 1117,) used the Menzer serum in 15 cases. Of these, six were benefited, four obtained doubtful relief and five were not relieved. The author closely agrees with Menzer as to the mode of action of the serum. It is not antitoxic in its action. He obtained the best results in subacute cases of rheumatism, but little effect in the acute, and none in the chronic.

SMALLPOX.—In view of the claims of Moser concerning the use of antistreptococcic serum in scarlet fever, Perkins and Pay (The Journal of Medical Research, 1903, Vol. X, No. 2,) administered such a serum in nine cases of smallpox. In this disease the authors had found streptococci present in the circulating blood in 54 per cent. of the cases examined, and in the heart's blood of practically all the cases examined at autopsy.

Of the nine cases treated with the serum, in none could any benefit be detected. Where streptococci were in the circulating blood the serum treatment did not diminish their number.

In order to make up any possible deficiency in the so-called complement in the patients' sera, and thus enable the immune bodies in the antistreptococcic serum to bring the complement into union with the infecting organisms, according to Ehrlich's theory of bacteriolytic action, normal serum from a healthy person was administered to three cases who also received the antistreptococcic serum. No benefit was noted from this treatment.

ENDOCARDITIS.—Horder (Lancet 1904, Volume II, No. 3, p. 143,) reports a unique case of chronic streptococcus endocarditis, in which the infecting microorganisms were isolated from the circulating blood of the patient and were utilized in the the immunization of a donkey whose serum was used in the treatment of the case.

Preceding the injection of the serum of the well immunized donkey, the patient was injected with 30 cubic centimetres of serum from a normal person, with the idea of making up for any deficiency of complement in her own serum. Also just before the use of the immune serum, normal donkey serum was administered as a control test. No beneficial change in the clinical symptoms of the patient was noticed from the use of these sera.

A horse was also immunized with the streptococcus isolated from the patient's blood, but the administration of this serum did not produce any beneficial change in the patient.

The author concludes that the case was either one of mixed infection or that the immune body was deficient in the specially prepared anti-streptococcic sera, or that the patient's serum did not contain sufficient complement to bring about bacteriolysis of the infecting streptococci. He believes that neither of the two latter deficiencies existed.

VETERINARY SANITATION.

VERANUS M. MOORE, B. S, M. D.,

Professor of Comparative Pathology, Cornell University, Ithaca, N. Y.

VACCINATION AGAINST TUBERCULOSIS IN CATTLE.—The very general distribution of literature throughout the dairy districts of the Eastern United States, announcing von Behring's method of immunizing young cattle against tuberculosis, is a matter worthy of very thoughtful consideration. The company which is announcing this discovery is also advocating its use in a practical way. The apparent successes attained are considered sufficient to warrant the most exaggerated statements concerning the efficiency of the method. So attractive are the statements that it will be surprising if many cattle owners are not induced to try the experiment without making further inquiry into its merit.

Von Behring has for a number of years been studying the effect of human tubercle bacilli upon cattle. His aim seems to have been to heighten the resistance of the inoculated animals to natural infection with tubercle bacilli from cattle. As his work continued, he hoped to immunize the treated animals to the disease. Although the results obtained lead the author to believe his theory of immunization of cattle against this disease will prove to be correct, they have not extended over a sufficient length of time to warrant the bold assertions of the American company that is trying to use the results in a purely commercial way. Before this can be justified, the following facts should be determined, namely: If immunity is established in cattle by the inoculation with the attenuated human tubercle bacilli, is such immunity permanent?

INFECTIOUSNESS OF THE MILK OF TUBERCULOUS COWS.—The question whether or not the milk of tuberculous cows is dangerous may be answered, in so far as the presence of tubercle bacilli are concerned, by a summary of the results of the various investigations into this subject that have been reported. Of the many investigations that have been made to determine the proportion of tuberculous cows which yield infectious milk, the average results are about 15 per cent., while the cases of tuberculosis of the udder are about 2 per cent. A further evidence of the frequency with which tubercle bacilli are present in the milk of tuberculous cows is found in the large number of calves and pigs that are found tuberculous among those fed with the milk of diseased cows. Last year the Federal meat inspection service condemned for tuberculosis about 20,000 hogs. An inquiry into the source of these animals shows that they come largely, if not entirely, from the dairy districts. During the last year the writer has had occasion to inspect the temperatures taken in the tuberculin test of a considerable number of young cattle, that, as calves, were fed milk from reacting cows. Of those under six months of age, over 80 per cent. gave the tuberculin reaction.

The fact seems to be clearly established that one of the serious means of transmitting tuberculosis to young animals is through the milk of tuberculous cows. This suggests the desirability of sterilizing all milk, not known to come from healthy cows, before it is fed to such animals. If we are to eliminate tuberculosis from our dairies, one of the very important things for every cattle owner to do is to protect the uninfected, especially the young.

NODULAR DISEASE OF THE INTESTINES OF SHEEP.—There is perhaps no affection so often mistaken for tuberculosis as the nodules on the intestines of sheep, caused, as pointed out by Curtice, by an invasion of the *Oesophagostoma Columbiana.* Not infrequently sheep are destroyed because of this parasitism, and often the carcasses of sheep slaughtered for food are rejected because of the presence of these nodules. The fact is, this parasite is quite widely distributed, and its appearance may be expected in almost any flock of sheep.

Recently, Dalrymple, of the Louisiana experiment station, has been conducting a series of experiments for the purpose of deterring the method of infestation of sheep with this worm, and also methods for its eradication from pastures. He found that infested sheep may distribute the worms on clean pastures and thus transmit them to healthy sheep which may subsequently graze upon the same fields. It was found that after the infested pastures had been plowed and cultivated for a single season, lambs may safely be allowed to graze upon them when subsequently they become pasture land. The offspring of infested ewes may be raised free of the parasite if the proper precautions are taken. It is suggested in the report that old infested pastures may be freed of the parasite by cultivation. This, however, will not meet the difficulty in many localities where sheep graze on land that can not be cultivated.

MUNICIPAL SANITATION.

CHARLES V. CHAPIN, M. D.,
Superintendent of Health, Providence, R. I.

FORMALDEHYDE DISINFECTION.—The State Board of Health of Maine,* in a recent circular, recommends a simple method of disinfection with formaldehyde. It is perhaps not intended that it should supplant all other methods, but it ought to prove convenient in country districts or in all places where it is difficult to obtain or transport the more common forms of apparatus. The principle employed is the liberation of the gas from formalin by the action of permanganate of potassium. The directions are to use a flaring ten-quart tin pail, which perhaps had best stand in a dish pan. The room should be made ready and 6 1-2 oz. of the permanganate for each pint of formalin should first be placed in the pail. Two pints of formalin should be used for every 1,000 cub. ft. of space. When everything is ready the formalin should be quickly poured upon the permanganate and the operator should hurriedly leave the room. A good deal of foaming takes place, so that if more than three pints of formalin are used, a larger pail, or two pails are necessary. The success of the process depends upon the fact that practically the whole of the formaldehyde is liberated in a few minutes, and that the heat of the reaction generates sufficient steam to ensure efficient disinfection. The permanganate in 10 lb. lots is said to cost 15c. a pound. This process was tested both in winter and summer in various apartments, mostly in cheap tenement houses, and with the following results. Of 1,529 test objects exposed only 27 showed a growth after incubation for at least 48 hours. Of these 27 unsuccessful results, 21 were with the exceedingly resistant hay bacillus (B. subtilis). None of the bacilli of diphtheria, typhoid fever, or other ordinary pathogenic germs, survived the exposure to formaldehyde.

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*State Board of Health of Maine Circular No. 75.

A NEW DOMESTIC FILTER.—Mr. James G. Woolworth of Providence, in a paper read before The American Chemical Society, described a new domestic water filter invented by himself. The mechanical basis of the filter is the ordinary Pasteur filter, though a tube of coarse pottery like that used for flower pots may be used instead of the ordinary porcelain. The essential part of the filter, as designed by Mr. Woolworth, consists of a layer of a mixture of mineral wool and freshly precipitated aluminum hydroxide applied to the pottery cylinder. The most remarkable thing about the filter is that the addition of this layer of fine filtering material increases instead of diminishing the flow of water. Thus, twenty-five minutes after starting, the delivery was seven times that of the naked tube, and at the end of fourteen days it was twice as great as that of the naked tube. Several specimens of this filter have been tested bacteriologically by Prof. F. P. Gorham, of Brown University, and chemically by Mr. Ernest F. Badger, Chemist of the Rhode Island State Board of Health. Prof. Gorham* states that a filter examined by him at frequent intervals for over a year invariably furnished sterile water. Other specimens of the same filter also furnished sterile water at every test. The filter needs cleaning much less often than the plain porcelain filter. According to Mr. Badger, the filter removes 95.9 per cent. of the color, 83.3 per cent. of the albuminoid ammonia in solution, and 100 per cent. of the albuminoid ammonia in suspension and 100 per cent. of the turbidity.

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* Remarks at a meeting of the American Society of Bacteriologists, Philadelphia, 1904.

THE EFFICACY OF HOUSE DISINFECTION.—House disinfection is done by most health officers without any inquiry as to its necessity or efficiency. The Baltimore Health Department* has attempted to show the efficiency of its disinfection. In a former report† it is stated that test cultures are placed in each house which is disinfected, and that that year of 1,242 of these cultures examined, 18 per cent. were found to have resisted the disinfectant. This would indicate that so far as the test organisms were concerned, the disinfection was successful in 82 per cent. of the houses. In the 1903 report it is shown that after 957 disinfections for scarlet fever the disease recurred 18 times, or in 1.8 per cent. of the cases, and after 1,168 disinfections for diphtheria it recurred 34 times, or in 2.9 per cent. of the cases. In 42 of the 52 recurrences the disinfection was tested by the exposure of bacterial tests in the room. According to these tests, the disinfection was successful in 83.4 of the cases. The report infers that the disinfection was successful because there were so few recurrences, assuming that the recurrences would have been much more numerous if there had been no disinfection, and claiming that some of the recurrences should be explained as due to failure of disinfection. While any attempt to investigate this subject is refreshing and praiseworthy, the inferences and assumptions do not seem to be warranted by the facts. There seem to be no data available anywhere to show the necessity for disinfection. It is just as reasonable, and in the writer's opinion a great deal more reasonable, to assume that these recurrences of the disease after disinfection are due to reinfection from some person in the house, rather than from the house or its material contents. That it is infected persons, not infected things, that cause recurrence of scarlet fever and diphtheria, seems to be borne out by the fact that such recurrences are just as common after the return of patients from the hospital as they are after the termination of isolation at home. The writer is not aware that any of the large hospitals in this country, as in New York, Boston and Philadelphia, have taken pains to publish their statistics relating to "return cases," but English statistics on this point are available. Thus in London* (*Metropolitan Asylums Board, Return Cases of Scarlet Fever and Diphtheria, Special Report 1901) in 1898-9, scarlet fever recurred in statistics on this point are available. Thus in London* in 1898-9, scarlet fever recurred in 2.9 per cent. of the houses to which patients returned after recovery and discharge from the hospital, and the recurrences in diphtheria were 1.9 per cent. Of course, both in Baltimore and London, it is probable that some of the recurrences were mere coincidences, but it is certain that the real recurrences after return from the hospital must be due to infection by the person of the convalescent. As recurrence after termination of isolation in the home is not more numerous, is it not likely to arise from the same source and not from infected things?

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* Annual Report of the Health Department of the City of Baltimore, 1903, page 122.
† Annual Report of the Health Department of the City of Baltimore, 1902, page 145.

SINGLE SERVICE PAPER MILK BOTTLES† — Paper milk bottles have recently been placed upon the market, and Dr. A. H. Stewart, of the Bacteriological Department, Philadelphia Bureau of Health, has tested their efficiency. The bottles are very strong and do not leak. They are made waterproof and sterlized at the same time, by dipping in a bath of hot paraffin. He found that the bottles were sterile, and that the milk shipped in them contained about one-fourth as many bacteria as that shipped in glass bottles. They cost about a cent apiece.

VITAL STATISTICS.

JOHN S. FULTON, M. D.,
Secretary Maryland State Board of Health.

THE VITAL STATISTICS FOR INDIANA in 1903 are published in the twenty-second annual report of the State Board of Health. The registration law of Indiana has one unique penalty. In case a body is buried before the death record has been made, the body may be exhumed. The Indiana law appears to secure good numerical results. The death rate for 1903 is 13.46 per 1,000. This rate is consistent with the reported experience of that part of the country, though the figures are not quite convincing. The results promise very well for the early admission of Indiana to the group of registration States. The report for 1903 is the fourth annual report on vital statistics. The mortality is tabulated by ages, by locality, by months, by sex, by nationality and by conjugal condition. The distribution of the population by ages is not stated. One wonders whether an age distribution of population could be satisfactorily determined for Indiana. It is said that among those who were blessed with children during 1903 there were 35 mothers above the age of 60 years. The registration of births in Indiana is very unsatisfactory, as is the case almost throughout the United States.

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* Met. Asylums Board, Return Cases of Scarlet Fever and Diphtheria, Special Report, 1901.

† *Medical News*, January 28, 1905.

Mr. Adams, in the article mentioned above, calls attention to one of the weaknesses of medical death certification. A "prominent Cincinnati physician" admitted to Mr. Adams that he never certified deaths from tuberculosis. Such deaths in his practice are certified as due to bronchitis. It is said that in France this prevarication is very common, insomuch that the bronchitis account is generally understood to include the consumption mortality.

In this country a considerable part of the consumption mortality is hidden in the accounts of bronchitis and pneumonia. It seems likely that this particular falsification has increased with the growth of industrial insurance. Mr. Frederick Hoffman does not think that falsification of death certificates plays any part in the apparent decline of tuberculosis or in the apparent rise of pneumonia. The great industrial companies, such as Prudential and Metropolitan, he says, do not void their contracts in case of early death from tuberculosis. Moreover, the falsification of a death return is a grave violation of law. Nevertheless I believe that deaths from tuberculosis are very often deliberately certified as due to bronchitis or to pneumonia.

The death certificates of a Baltimore physician, having a large practice among wage-earners, were found to include so many deaths from bronchitis that he was sent for and confronted with his certificates. He admitted that some of these patients were consumptives, but pleaded in extenuation that nearly all of his patients were insured, most of them in small concerns, and that certificates of death from tuberculosis endangered, if they did not void, death claims.

The Maryland Tuberculosis Commission secured a similar confession from another physician, whose consumptives were often certified as having died of pneumonia. He argued that the statement was not essentially false, since pneumonia often terminates the lives of consumptives.

One of Baltimore's very distinguished physicians has told me of the harrowing sensations which he himself more than once experienced after having certified to death from tuberculosis, and so extinguished the only asset of an impoverished family. He thinks that the rewards of virtue are not so sweet when one's veracity helps to compound so great an injustice.

THE SANATORIUM TREATMENT OF PHTHISIS*— The author asks, and attempts to answer, the question, "Is It Worth While?" It is a very suggestive paper, and is the subject of no less suggestive comment by the editor. Dr. Ransom makes an affirmative answer to the inquiry, and the major part of his paper is devoted to a consideration of sanatorium statistics. He points out quite clearly the defects and fallacies of these numerical statements, and one concludes that Dr. Ransom's favorable view of sanatorium treatment is based chiefly upon personal impressions.

The editor believes that it is not possible to justify by statistical evidence the free expenditure of public money on care of the tuberculous poor in sanatoria. When the wide scope of this particular agency in the antituberculosis campaign has come into view, demand will be made for very definite proof of economic profits, and this proof can only be given in statistical form. Comparable records in great mass, representing not only the results of sanatorium treatment, but also the economic relations of other modes of treatment, will be needed. Such evidence is not now accumulating. There is no substantial agreement as to classification of cases, or of results. The nomenclature is quite diversified, and marked differences exist as to the significance of such words as "incipent," "advanced," "arrest," "improvement," "cure," "able to work," "economic cure." "Economic cure," the author thinks, is an especially dangerous phrase.

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* Dr. W. B. Ransom, *Brit. Med. Journal*, Jan. 14, 1905.

The confusion sure to arise if sanatorium records continue to be made in this haphazard fashion has been considered in this country by the American Climatological Society. To reduce to narrow limits the error inevitable in even the most careful analysis of testimony from many observers would be an important work for the National Association for the Study and Prevention of Tuberculosis. It could be done by securing the general adoption of a uniform and clearly defined nomenclature.

CANADIAN NOTES.

JOHN A. AMYOT, M. D.,
Provincial Board of Health of Ontario.

REPORT OF THE GRAVENHURST SANATORIUM.—Dr. Parfitt in his report of the results obtained in the treatment of the cases coming under his charge in the Muskoka Free Hospital for Consumptives. In two years 261 cases were admitted of all types. Forty-seven of the cases either remained less than a month in the institution or were admitted only for instruction and to die. Of the 169 remaining in the hosipital one month or more, only 30 cases were in the incipient stage, 91 had advanced disease and 48 were far advanced cases.

Of the 169 cases discharged, following Dr. Trudeau's terminology and definition, they were classified as follows: 34 cases "disease arrested," 57 cases "much improved," and 78 cases unimproved. Doctor thinks that amongst those classed under disease arrested that several might safely be looked on as cured. Many of the advanced cases have done very well. The average length of stay for all cases so far admitted (two years established) is 163 days.

SANITARY ENGINEERING.

ROBERT SPURR WESTON,
Boston.

WATER SUPPLY AND SANITARY CONDITION OF INDIANAPOLIS.—Indianapolis is supplied by a private company with deep well and filtered White River water. The Water Company has had to contend both against the pollution of the river by straw-board refuse, and also the continued opposition of the citizens. It has spent large sums in improving its supply; nevertheless the opposition of the citizens became so strong, especially after the typhoid fever epidemic of last spring, that a joint commission of competent experts, consisting of Mr. George W. Fuller for the Company, and Dr. C. E. Ferguson and Mr. B. J. T. Jeup for the City, was appointed to investigate the character of the supply and the general sanitary condition of the City; therefore comprehending the degree of the Company's responsibility for the recent epidemic.

The vital statistics of the City were so imperfect that it was impossible to ascertain the history of the epidemic by this means. Cases of fever were often unrecorded by the physicians. Sometimes they were not reported until after the patient's death. There were two conditions, however, which rendered the typhoid statistics of comparatively little importance.

First: In this city of 200,000 people there were only 13,500 water services, while about 25,000 private wells were in use.

Second: There were only about 8,800 water closet connections.

Had the company furnished unfiltered White River water, the sanitary character of the supply would have been better than the character of the surroundings of the majority of the homes of the city. The company has always furnished water of good sanitary character to the best of its knowledge, and was exonerated by the Commission.

It is blameworthy that this large, well sewered and well watered city should have its health menaced by open privies, cess-pools and wells of unknown or doubtful history. The laxness of the physicians in not reporting cases of typhoid is to be condemned. With better statistics, conditions bad for the health of the community could be more promptly recognized and done away with.

ANALYSIS OF ILLINOIS WATERS (2).—This report surveys the present condition of Illinois water supplies drawn from lakes, streams and wells; the determination of the normal condition of unpolluted waters and the formulation of data for judging the quality of potable waters. The report is divided into three main parts:

1. A brief consideration of the sanitary conditions of the ordinary ground waters, and matters relating thereto,—accompanying this there is a paper upon "The Geology of Illinois, as Related to Water Supplies," by Prof. Charles W. Rolfe.
2. Results of mineral analysis of some 460 samples of water, —mainly from wells of considerable depth.
3. A report of the investigation of the surface waters of the State relating to the Illinois River and some of its tributaries.

This report was about the last work of the late lamented Professor Palmer.

EXPERIENCE WITH THE COPPER SULPHATE TREATMENT AT HANOVER, N. H. (3).—During the summer of 1904 the upland water supplied to Hanover developed a fishy odor produced by algae. Water contained 600 organisms per c. c. Author advised trial of copper sulphate treatment, which was made. Treatment on July 18th reduced the algae 90 per cent. twenty-four hours after treatment, and after sixty hours no organisms could be found. Algae could not be found for ten weeks, but then began to be present in very small numbers during the last of September, after a drought which caused a reduction of the contents of the reservoir from 100,000,000 to 70,000,000 gals. The improvement in quantity was immediate, and no fish were killed. One part of copper sulphate to 400 parts of water was used.

ST. LOUIS WATER COAGULATION PLANT (4).—The St. Louis water supply, formerly subjected to plain subsidence only, is now clarified by subsidence wth the aid of a coagulant which has only quite recently come into use in connection with water supplies,—namely, ferrous sulphate, followed by lime. On the average, about 1.75 gr. of ferrous sulphate and 6.9 gr. of lime suffice to coagulate and clarify the water. The precipitate settles more rapidly than that produced by sulphate of alumina. The plant is designed to treat 120,000,000 gal. per acre per diem. The final product has only a slight turbidity and contains very few bacteria. The cost of treatment is quite low and can be reduced. It is believed that this process will make filtration unnecessary. However, should filtration become desirable in the future, it would find the greater part of the work of purification accomplished by these devices.

THE COPPER SULPHATE TREATMENT FOR TYPHOID BACILLI (2A).—It is announced that the value of copper sulphate as a destroyer of typhoid fever bacteria in water supplies has not been officially vouched for by Dr. George T. Moore of the U. S. Department of Agriculture,—editorials and other statements in the daily press notwithstanding.

CHARLES RIVER BASIN (6).—In 1903 the Charles River Dam Commission (7) recommended that a dam be built across the Charles River at Craigie's Bridge, to maintain it at a permanent elevation of about two feet below mean high tide. The dam will be of earth, retained between masonry walls. The top will be of varying width and will be laid out as a park of 6.5 acres, with a roadway 85 ft. wide running through it. There will be a small boat lock at the Cambridge side, and a lock 350 ft. by 45 ft. for large vessels at the Boston side of the basin.

Two intercepting sewers will collect the drainage on each side of the basin and will discharge below the dam. The two canals which now connect with the river are to be dredged and are to have their banks improved. This basin (area 830 acres, shore line 177.5 miles) forms the center of and its bordering drives make connections with the whole Metropolitan Park System.

Henry S. Prichett, Henry D. Yerxa and Joshua B. Holden are members of the Commission. Henry A. Miller, M. Am. Soc. C. E., is its chief engineer, and F. B. Stearns, M. Am. Soc. C. E., its consulting engineer.

NEW YORK'S ADDITIONAL WATER SUPPLY (5).—Present plans propose the immediate construction of a large storage reservoir at Esopus Creek, a 300,000,000 gallon aqueduct to the Borough of the Bronx, a 14,000,000,000 gallon reservoir in the Bronx, large conduits from the Bronx Reservoir to both Manhattan and Brooklyn Boroughs, a reservoir on Long Island and distribution mains in four of the five boroughs of the city. The estimated cost is about $90,000,000.

LABORATORY WORK.

FREDERIC P. GORHAM,

Associate Professor of Biology, Brown University, Providence, R. I.

THE DIRECT MICROSCOPICAL EXAMINATION OF BACTERIA.—The question frequently presents itself to those making bacteriological analyses of water, milk, sewage, etc., whether our methods of plating out samples really give us accurate determinations of the numbers of bacteria present. Does the number of colonies really represent the number of bacteria in the sample? Do all bacteria which may be present grow on our regular culture media? Winslow, in a paper read before the Society of American Bacteriologists at the Philadelphia meeting, 1904, and soon to be published in the Journal of Infectious Diseases, (with G. E. Wilcomb), attempts to answer these questions and has devised a method for the actual enumeration of all bacteria present in a sample by direct microscopical examination.

"One-twentieth of a cubic centimeter of the liquid to be examined is discharged from a sterile graduated pipuette on a carefully cleaned coverglass of known diameter. This is dried in the air, fixed, and stained in the usual manner with carbol-fuchsin. The bacteria in ten square fields, 0.1 mm. on a side, are counted by the aid of a Sedgwick-Rafter micrometer and the total number determined by multiplication. This method is rapid, easy, and accurate, but applicable only to fluids like sewage which contain 25,000 or more bacteria per c. c. The results obtained when pure cultures are examined check very closely with those of the plate method even when the number of bacteria is decreasing very materially. Thus it appears that dead bodies of bacteria are quickly removed in the presence of other living germs and introduce no serious error. On the other hand, sewage and sewage effluents show numbers, 10 to 100 times as high as the plate count, due mainly to the inclusion of forms which do not grow on ordinary media."

SYNTHETIC CULTURE MEDIA.—In our study of the bacteria from the hygienic standpoint we are apt to overlook the fact that in these minute organisms we have an opportunity of getting a very close insight into the exact chemical changes which are taking place in the cells. We are able to feed them wth certain compounds the exact chemical constitution of which is known, and we are able to analyze the contents of the cells themselves as well as the products resulting from their growth. In order that these analyses have any value, however, other media than those usually employed must be used. In spite of the efforts of the Bacteriological Committee of the American Public Health Association to bring about the adoption of uniform methods for preparing culture media, the fact still remains that uniform methods are of no avail unless the substances entering into the media are of uniform composition. The meat, peptone, gelatin, and agar vary much in their composition, and it will be impossible to secure exactly uniform media, at least from the chemical standpont, as long as these substiances are employed in their present form. Robin* has suggested that an attempt be made to get the manufacturers of the meat extracts, gelatin, etc., to put up special lots for the use of bacteriologists, which could be guaranteed uniform. A much better suggestion and one which will in time find favor with bacteriologists, especially those working along chemical lines, is the adoption of proteid free media, made by the synthesis of the salts which are necessary for bacterial growth.

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* Centralbl. f. Bakteriol, etc., 2 Abt., Jena, 1904, xiii. 228.

Many authors have published formulae for such solutions which up to the present time have of necessity been liquids. No solidifying substances whose chemical composition could be exactly determined and controlled had been devised. Dr. Erwin F. Smith in a communication read before the American Association for the Advancement of Science at its Boston meetings in 1898[*] suggested the use of a starch jelly, and more recently Dr. M. X. Sullivan, in a paper read before the Society of American Bacteriologists at its Washington meeting, 1902, described a culture medium made by adding the various nutrient salts to a solution of sodium silicate. This gives a solid medium, non-liquefiable, it is true, yet extremely useful in determining the chemistry of the bacterial growth. Dr. Sullivan used this medium in working out certain problems connected with the production of bacterial pigments.

This silicate jelly has been still further modified and improved by Dr. Erwin F. Smith and will be described in his monograph on the Bacterial Diseases of Plants. (Carnegie Institution.) It is easy, by his method, to prepare a silicate jelly free from glycerine, and at the same time having a moist, smooth surface well adapted to the growth of many bacteria.

The use of some such solidifying medium as this silicate jelly will undoubtedly be found advantageous in studying many of the problems connected with the chemistry of the bacterial cell.

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[*] Proc. Am. Asso. Adv. Sci. Boston Meeting, 1898, xlvii. 411.

[†] Science, N. S., 1903, xvii., and Centralb. f. Bakteriol, etc., 1 Abt. Jena, 1903, xxxiii. 277, and Centralbl. f. Bakteriol, etc., 2 Abt. Jena, 1903, x. 386.

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THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH was organized in Boston, March, 1890, *with the following objects; The advancement of sanitary science; the promotion of better organization and co-operation among local boards of health, and the uniform enforcement of sanitary laws and regulations*

THE JOURNAL OF THIS ASSOCIATION has for fifteen years faithfully reflected the views of the public hygienists of Massachusetts. With the November issue of the year 1904, *the encouragement received from many hygienic quarters induced the Association to undertake the expansion of the Journal to a national standard, with the co-operation of many noted sanitarians as editors. A new title was selected, while the older and well-established title was retained also.*

The dates of publication are FEBRUARY, MAY, AUGUST *and* NOVEMBER *of each year.*

THE JOURNAL will contain the papers read at the meetings of the Association, papers contributed by hygienists, reports of the discussions, editorials, abstracts, reviews and hygienic notes of professional interest. Subscription rates, $1.00 *per year. Reprints furnished at cost price.*

All communications concerning the JOURNAL, copy, proof, subscriptions, advertisements, etc., should be addressed to the Managing Editor, DR. H. W. HILL, 739 *BOYLSTON ST., BOSTON, MASS.*

All communications concerning the ASSOCIATION should be addressed ta the Secretary of the Association, JAMES C. COFFEY, CITY HALL, WORCESTER, MASS.

All bills not relating to the Journal, and MEMBERSHIP DUES ($2.00 *per year), should be sent to the Treasurer of the Association, DR. JAMES B. FIELD,* 329 *WESTFORD ST., LOWELL, MASS.*

EDITORIALS.

"DIRT" AS A SOURCE OF DISEASE.

"Dirt," in the sense of human excrement, has been considered at length by Professor Sedgwick in an excellent series of articles, which have appeared in this journal for some months past. The present article considers dirt and dust in the more ordinary and usual meaning of those terms.

The objections to dirt and dust are three in number, the aesthetic or sensory, the psychical or moral, and the hygienic. The aesthetic objections are optical, as when agreeable colors or lines are obscured by dirt or dust; second, tactile, as when something feels gritty or greasy, which should not feel so; gustatory, as when one can "taste dust in the air;" olfactory, as when one smells decomposing dirt, and sometimes auditory, as when a machine purrs or clacks from dirt in the bearings. But dirt is simply matter out of place; the oil that on a pair of white kid gloves is "dirt," would be, in the bearings of a machine, a saving grace. Fresh morning dew mixed with a little pure sand or clay "dirties" one's shoes, and one proceeds to "clean" them by daubing them with a mixture of grease, soot, and often saliva, which, carefully smoothed by rubbing until it shines, is considered quite ornamental.

The psychical objections to dirt and dust lie chiefly in an association of ideas between dirt and dust on the one hand and carelessness, laxness and slip-shod methods on the other. A dirty man is objectionable from this standpoint because of the implication from his appearance that he is "sloppy" in other things as well. Yet a battle-stained hero fresh from the field is adored for the very dirt and dust with which he is covered, because in this case, the significance of the dirt is the reverse of its ordinary significance. The dirt and dust which on a locomotive engineer is a symbol of his responsible, and to some minds, even romantic, occupation, would, in the case of a banker, disqualify him for business.

The hygienic objections to dirt and dust are based on the external action of its particles in clogging the mouths of the ducts of excretory glands of the skin, irritating the eyes, producing chafing between skin surfaces in contact, etc., and their internal action, varying with the size, shape and material of which these particles are composed, from practically nothing to severe irritation, upon the mucous membrane of the nose, throat and lungs and intestines. Here the mere mechanical irritation, as in the case of fine sand, may produce severe discomfort. Certain chemical dusts may, by absorption, produce specific poisonings, and in any case, irritation set up in such ways, probably tends to make more easy the operation of harmful bacteria, if these should reach the irritated membranes. Bacteria of some form or other, generally harmless, sometimes, if the right conditions be provided, harmful, are likely to be present in the mouth, nose, throat and intestine of everyone, and dirt or dust, not itself infected, may, on reaching the mucous membranes, irritate them sufficiently to permit the harmful action of bacteria already present there.

As distinct from the conditions outlined in the last paragraph, the actual transmission of disease through dust and dirt is probably the smallest and least important of all the objections to them. Dust and dirt can transmit disease only when infected, and infected dust and dirt forms only a very small proportion of the total dust and dirt in the world. Tuberculosis may sometimes be conveyed in this way. Garden mould (in some sections of the world), if admitted to some forms of wounds may give rise to lockjaw because the tetanus organism is in some places a normal inhabitant of the soil. Typhoid-infected excreta, transferred by food, drinks, or otherwise, to the mouth may transmit typhoid fever. But in general, the typical infectious diseases of the temperate zone, diphtheria, scarlet fever, tuberculosis, and the rarer smallpox, are not commonly conveyed otherwise than pretty directly from patient to patient. The older ideas that dirt and dust would or could in themselves generate disease is now quite as thoroughly exploded as the hypothesis of spontaneous generation. Dirt and dust are enemies to progress, refinement, civilization, and sometimes to health, but they do not in themselves propagate or even to any great extent transmit the ordinary infectious diseases. The presence of bacteria, when, as is usual, they do not belong to any of the specific disease-producing forms, adds no great objection to dust, for bacteria are present already in the nose, throat, etc., of every one, in milk, water, foods, etc. The degree of legitimate fear from the standpoint of infection with which any given aggregation of dirt or dust may properly be regarded, is proportionate entirely in each case to the number and kinds of opportunity of infection from diseased persons to which the particular dust or dirt in question has been exposed. To illustrate by reference to two extremes, the infectiveness of the dust and dirt of a crowded tubercular hospital ward is enormous compared with the dust and dirt of an Arizona desert. Of course, all intermediate grades of infectiveness occur.

Dirt, in the sense of human excreta, is like other dirt, dangerous only when infected. The safe rule to follow, however, is to consider all such excrement "guilty until it is proved innocent." In the case of the accumulated excreta of communities which constitutes "sewage," such an assumption is probably always more or less correct at some time or other. Since it is impossible to say of any given sewage at any given time that it is not infective, it is safest to regard it and handle it always as if it were infected.

INDIVIDUAL FACTORS IN HYGIENE.

There are three sets of individual factors in hygiene.

1. Those depending on what one wants to get out of life.
2. Those depending on the race, climate, age and sex of the individual.

> 3. Those depending on the individual peculiarities of one's tissues,—peculiarities by reason of which "one man's food is another man's poison" in all departments of hygiene.

1. A man who wants to get out of himself the largest amount of work possible will adopt hygienic rules quite different from those of the man who gets his satisfaction not in work, but in variety. "If you want to keep yourself in the pink of condition and secure a rounded development of your body, you should do so and so," says the trainer. "But I don't," one may reply. "I like better the kind of life that entails some ups and downs and development along certain lines—not all."

One cannot advise a man how to travel until one knows where he wants to go. So it is with hygiene.

2. Hygienic rules cannot be laid down without reference to race, climate, age and sex. The hygiene of Orientals is not that of "Anglo-Saxons," and in all probability ought not to be. Hygiene in the tropics is certainly different from that of colder countries. The adolescent years have surely their own special needs. These factors when combined with differences in age and sex sub-divide and specialize the problem of hygiene until it becomes almost as complex as the organization of modern industry. We can no longer hope for an universal hygiene that shall be other than uselessly vague. When we work out a hygiene for Americans of the temperate zone, it will not be binding on Orientals or on any tropical people. The rules for city folks will, in all probability, be very different from those for country folks. The hygiene of those under 40 will probably be found materially different from that suitable for septuagenarians, and so on.

3. But besides the individual factors introduced by personal ideals and by environment (taken in its broadest sense) there is another set of differences which separate us man from man as distinctly as our handwritings or our voices. These differences can be more easily exemplified than defined. The rate at which we live is a case of what I mean.

One man walks, talks, eats, digests, rests more rapidly than another. There is no single normal rate any more than there is for pulses. A's rate of walking is as easy for him as B's quicker and C's slower pace. A gets his night's rest in eight hours, and to all appearances he gets in that time as much rest as B does in ten hours and no more than C does in six.

These are quantitative differences, but the qualitative divergence is just as clear. What rests you tires me. My arrangement of meals will not suit you. The exercise which is good for you disagrees with me.

Do these manifold differences make it impossible for us to lay down any rules? General rules, I think, remain. A man must get some food, some rest, some air, but in all the essential particulars which make the difference between splendid health, moderate health, and rather poor health, I believe the individual is, and must be, a law unto himself, as he is in politics and religion. There are ways, not only one way, of keeping well. To classify oneself is the paramount hygienic duty. Do you belong to the class of those who rested by change of work or do you not? Are you one of those who is benefitted by going without breakfast, or are you not? What is your proper allowances of sleep? What is your best recreation? No doctor can find out for you the answers to these questions half as surely and swiftly as you can find out for yourself by instinct and experiment.

To know the answer to these and similar questions is more important, I think, than to know how to read and write. Nothing that I know of would so gladly benefit the health of the community as a study by each individual of his individual hygienic needs. Our right of private judgment does not always lead us to very intelligent conclusions in politics or religion, because too often we are not very vitally interested in these matters and accept a party slogan or an inherited creed without qustion or investigation. But in our own health we are most of us unmistakably and unfeignedly interested and with a little guidance we could, I believe, arrive at much more successful methods of living by our own investigations than by following another person's set of rules. The physician's business cannot well include the settling for every man of such intimate and personal questions as how to keep well. The physician is of value when we are sick, but when we are well it is as awkward and difficult for him to find for another man his proper way of fitting himself into the unique environment, temperament and individuality with which he finds himself endowed, as it is to tie another man's necktie for him. Such an effort is a wasteful and inconvenient one.

Now I do not think that science need be wholly dumb and passive in this matter. She can suggest alternatives worth investigating. She can tabulate by statistics the plans of living which have actually turned out to work well and plot them like a set of roads on a map. "On or near some one of these roads," scientific hygiene will then say, "You will probably travel if you want to be well. Look into them—try them as a man looks up a neighborhood for building a house or chooses a profession. Here are the likely paths."

This means that someone must undertake an enormous labor of statistical inquiry into the actual habit of healthy Americans. How have the hygienic successes of this country been achieved? What plans of living as regards food, sleep, water, air, exercise and recreation have actually proved workable. I think it will turn out that there are not more than half a dozen leading "centres of success" (like the chief centres of population) and that through one of half a dozen plans of life most hygienic successes have been achieved. To ascertain these facts I propose to devote a good deal of time and money in the next years. I want to collect statistics portraying the actual habits of 50,000 of the healthiest Americans in all parts of the country. Through my friends in and out of the medical profession, I think I can collect this body of data. Later on I may be appealing to some of you gentlemen to assist me in this investigation.

RICHARD C. CABOT.

APRIL QUARTERLY MEETING
OF THE
Massachusetts Association of Boards of Health.

The quarterly meeting of the Association was held at the Brunswick Hotel, Boylston street, Boston, on Wednesday, April 26, 1905, Vice-President Samuel H. Durgin presiding.

Mr. James C. Coffey, Secretary, read the records of the January meeting, and they were approved.

VICE-PRESIDENT DURGIN: The Executive Committee recommends the following names of persons proposed for membership in the Association:

H. C. Bullard, North Attleboro.
Dr. S. O. Pilling, Newburyport.
Dr. George E. Norton, Cambridge.
Dr. Frank A. Murphy, Taunton.
Dr. J. Forrest Burnham, Lawrence.
Dr. F. B. Gunter, Chelsea.
Dr. R. V. Sawin, Brimfield.
Dr. E. Frank Guild, Chelsea.
Dr. Richard M. Raymond, Framingham.
George E. Harrington, Sudbury.
Dr. Thomas Piggott, Winthrop.
Arthur A. Hayden, Melrose.
Dr. M. V. Pierce, Milton.
William O. Safford, Salem.

On motion of Mr. Coffey, the gentlemen named were elected to membership.

VICE-PRESIDENT DURGIN.—We are fortunate in having a gentleman to speak to us this afternoon upon a live subject throughout the State, and perhaps throughout the country. I have the pleasure of introducing Prof. William T. Councilman of Harvard University, who will read a paper on "Cerebro-Spinal Meningitis."

CEREBRO-SPINAL MENINGITIS.

By **Prof. William T. Councilman, of Harvard University.**

I should probably apologize before such an audience for treating this subject from an anatomical, rather than from the epidemiological point of view. I think, however, there is something to be said in favor of taking the subject from the anatomical point of view, because this gives us certain clues towards the understanding of the disease.

Cerebro-spinal meningitis, especially the epidemic form, is a disease of which we really know very little. We know something anatomically about the process, we very probably know the micro-organism which produces it, but that is all. Just under what conditions the micro-organism produces the disease, and how it reaches the tissues, are points on which we are still very ignorant.

The tissue which is invaded is the tissue which covers the brain here in my hand. (Exhibiting specimen.) The membrane which is affected is the pia arachnoid which covers the brain and dips down between the convolutions. The pia arachnoid is a peculiar tissue. The side which corresponds to the dura, forming one side of the subdural space, is smooth, resembling the inside of a lymph vessel. The side in contact with the brain is composed of a definite layer of connective tissue, and between the two is a loose connective tissue filled with spaces. All of the blood vessels of the brain ramify in the pia arachnoid, giving off vessels which enter the brain. The larger vessels are accompanied by processes of the pia arachnoid. The capillaries given off from these have no accompanying tissue.

The pia arachnoid is always filled with a fluid, the cerebrospinal fluid. That fluid is secreted by a structure, the choroid plexus, which forms a part of the membrane which passes into the ventricles of the brain. This fluid is constantly being secreted. It enters into all of the spaces of this membrane, so that both brain and cord are almost floating in the fluid. The fluid must escape in some way, and the manner in which it passes out from this tissue gives us a clue to the connections which exist between the pia arachnoid and the other tissues of the body. The spaces which we find within this membrane are continuous with the perineural lymphatics of the cerebral nerves and with the perivascular lymphatics. In this way there is a direct lymphatic connection between the spaces in the membrane here and the lymph spaces in the remainder of the body. The fluid in the meshes of the membrane can also pass into the longitudinal sinus by oblique valve-like openings.

Micro-organisms can enter into the pia arachnoid in various ways, and can produce acute inflammations of it. A great number of organisms can so act. For instance, in going over our cultures made from the meninges in cerebro spinal meningitis, we find cases in which pneumococci, staphylococci, the streptococci, in fact, all of the ordinary pus organisms, have been the causative agents. The tubercle bacilli may enter into the membrane, producing tubercular meningitis. We have had cases in which meningitis was produced by the anthrax bacillus, cases in which it was produced by the typhoid. In all of these different forms of meningitis which are so produced there is a great deal of similarity in the gross appearance, so that in the place of showing you the lesions from cases of epidemic cerebro-spinal meningitis, I am going to show you some of the lesions which have been produced by one of the ordinary pus organisms. It would be impossible to distinguish microscopically the different varieties of meningitis.

How are these organisms to get into the tissue? Of course, they can enter into it directly from without, in cases of wounds involving the membranes and by continuity of affected tissue, as in erysipelas of the scalp. In cases of otitis media and mastoiditis, organism may enter either by continuity or by lymphatics. One of the most common causes of meningitis in general is inflammaton of the middle ear, with mastoiditis. Of course, organisms may enter into the membrane conveyed thither by the blood. This is not a common method. It is comparatively rare that we find cases of acute meningitis accompanying infections in other parts of the body. When organisms enter into the blood and are conveyed to the brain, they are far more apt to produce acute inflammation in the brain itself than in the membranes over it. We find the same thing experimentally. Thus experimentally in animals, by the injection of staphylococcus into the lung, and by various other organisms, it is possible to produce experimental lesions in the brain. Of course, sometimes those may be accompanied by inflammations of the meninges, but we are far more apt to have inflammations of the brain itself produced by blood infection.

The epidemic cerebro spinal meningitis appears both in sporadic forms and in epidemics. It differs from the ordinary cases, not only in its etiology, but in appearing in epidemics. I pass around a specimen which shows a slice of the cortex of the brain, taking the membrane with a portion of the brain substance. If you examine this you will find that the outside of the brain is so covered by a thick, yellowish deposit that in places the convolutions cannot be seen through it. The specimen has been so preserved that the fresh appearance is perfectly retained. The specimen is from a case of meningitis which was produced by the streptococcus, but it shows exactly the same condition which would have been produced by the other organism, the meningococcus.

The next specimen shows a section of the brain made lower down so that the convolutions of the brain here are cut in various ways, and you see the membrane dipping down between the convolutions. Wherever the membrane is you see there is the same sort of deposit which you saw on the surface. I will also call your attention to the redness of the tissue. The redness of the tissue is due to an injection of the blood vessels. The tissue is very much more hyperaemic than it normally should be, and looking at it closely you will see a number of tiny red points. These tiny red points show that minute haemorrhages have taken place in the cortex.

Then there is another very interesting thing about the epidemic cerebro-spinal meningitis, and it is true to a less extent with the other forms of meningitis, that the damage is rarely confined to the outside of the brain, but in addition to this inflammation of the membranes we find there is a certain amount of inflammation of the brain also. The connection between the brain itself and this covering on the outside of it is so close that in the majority of cases we have some affection of the brain itself. The tendency for the infection to extend into the brain is more marked in cerebro-spinal meningitis than it is in any other forms.

We believe that the disease is produced by a micro-organism, a bacterium, which belongs to the micrococci. It is a very small organism, and it always occurs in pairs. It also occurs within the pus cells. The plates which I pass around and which most of you have probably seen show various relations of the organisms and the lesions.

There are very important points, I think, in relation to the organism. The organism is one which, in the first place, does not grow with great ease. On many of the culture media it does not grow at all. It grows on blood serum, and it grows on agar which has been mixed with blood. I have here a pure culture of the organism which was made from a recent fatal case. I will pass this around, and you will observe that on the surface there is a more or less smeary growth. You cannot see the individual colonies; they are so abundant here that they have all run together.

We find this organism both in spinal puncture and in the tissues in all cases of the epidemic cerebro-spinal meningitis. We do not find it in the other forms. Usually it occurs alone, but we have found it associated with other organisms.

When the lesions are studied microscopically we find the organism associated with them. The earlier and the more virulent the case is, the greater the number of organisms found.

In the very early cases, which die in two or three days, we find the organisms present in very large numbers. In the later cases of the disease, those which have lasted for a number of days, or two or three weeks, we may find comparatively few of the organisms, or they may be entirely absent.

Most of the laboratory animals are very slightly susceptible to infection with this organism. Both rabbits and guinea pigs are susceptible if very large amounts of pure cultures are injected into them. We once succeeded in producing acute meningitis in a goat by injecting a pure culture of the organism into the spinal canal. So that it seems to me that we can regard it as certain that this organism is definitely associated with the disease, that it is one of the causes of the disease. It is uncertain as to whether the organism alone is sufficient. It is very possible that there may be other and unknown conditions which render it possible for the organism to produce the disease.

I have told you that it was difficult to grow. It is also an organism of very feeble vitality and is easily destroyed. We made some experiments in 1898 with regard to the resistance of the organism, and we found that exposure to sunlight for a very short while was sufficient to destroy it, and exposure for a few days to the ordinary light of the room will destroy it. It will live for several days if kept in the dark. All sorts of antiseptics destroy the organism easily. The organism has never been found outside of the animal body, and the chances are that it could not live as a saprophyte.

The disease occurs both sporadically and in epidemics, which differ greatly in their extent and mortality. From 1898 to 1904 there have been 61 cases of meningitis in the Boston City and Massachusetts General Hospitals. In all of these cases the organisms have been carefully determined by culture. Twenty of these cases were produced by the diplococcus meningitidis, making it of the epidemic variety. These cases give us but little idea of the frequency of the disease. A great many cases recover, and many die without it being possible to determine the nature of the disease by autopsy. The mortality is less in the epidemic cerebro-spinal meningitis than in any of the other forms. Tubercular meningitis is always fatal, and the same is probably true of the cases which are produced by the ordinary pus organisms. I have been able, in going over the literature, to find no case in which pyogenic organisms were found in the fluid withdrawn by lumbar puncture, which have recovered. The mortality in epidemic cerebro-spinal meningitis varies from 20 to 80 per cent. It is higher in epidemics than in sporadic cases. It might at first seem that the organism was kept alive in the period between epidemics by the sporadic cases and infection followed from case to case. On closer examination this does not seem probable. In an epidemic it is comparatively rare that we find several cases from the same house or that the disease is especially prevalent in certain localities. It seems probable that density of population and bad hygienic surroundings favor the extension of the disease, but all experience in hospitals goes to show that there is but little tendency for the disease to spread by close infection. The nurses, attendants, and physicians who have charge of such cases have generally remained free from the disease. It also does not seem that the sporadic cases are sufficiently numerous for the disease to be kept alive by extension from case to case. If the organism were capable of existing as a saprophyte outside of the body it might be spread by sporadic cases, but all the evidence is opposed to this. It is of great importance to find that the organism is not confined to cerebro-spinal meningitis. There are a great many reports in the literature showing that the organism may be found in the nose in cases of acute coryza, and also under normal conditions. Many of these reports are unreliable because the organism has been confounded with a common inhabitant of the nose, the micrococcus catarrhalis which it closely resembles morphologically, and can only be distinguished from it by cultures. There are a number of cases, however, which are free from criticism, showing the presence of the organism in the nose with or without coryza. I know of one case in which the organism has been found in cultures made from the nose extending over a period of two years. What we know now of the disease and the organism causing it leads me to believe that the micrococcus meningitidis may be a not infrequent inhabitant of the nose in normal individuals, that it may be the cause of acute coryza; that under certain conditions the organism may pass from the nose into the meninges, probably extending by means of the lymphatic connections and give rise to cerebro-spinal meningitis. The great extension of the disease which occurs in epidemics may be due to the fact that under certain conditions, the nature of which we do not know, either the number and the virulence of the organisms may be very greatly increased, or there may be conditions affecting large numbers of individuals which increase their susceptibility, and then the number of infections increase. It is very probable that we have to do with very analogous conditions in pneumonia and also in influenza.

VICE-PRESIDENT DURGIN: This paper is now open to discussion. We shall be glad to hear from Dr. Morse, who has seen a good many of these cases about the State in the last few weeks.

DR. MORSE: Mr. President, Members of the Association: It is always of considerable importance to local boards of health to know just how many cases of this disease have occurred within past years, how many are present in the State today, and what can be done to prevent its further spread and to cure those who are already affected with it.

If we review the figures for the last ten years we will find that this period includes the large epidemic of 1896 and 1897, which was so carefully studied by Dr. Councilman and his assistants. Reckoning up the deaths of this ten-year period we find that there were 3540 deaths from 1895 to 1904 inclusive, an average of 354 deaths, or one for almost every day in the year in this State. We have recently learned through the newspapers that at the present time we have been having an increased number of cases, but if the same fatality keeps up for the remainder of the year that occurred during the first three months, we will only have 364 deaths for the present year, an increase of only ten over an average of ten years, and surely not an alarming condition.

These cases have been distributed more or less throughout the State. The Metropolitan district since the first of January has had 66 cases, the district to the north of Boston and the Metropolitan district has had 76 cases. In the middle of the State there have been 9 cases, south of Boston 14 cases, and west of the Connecticut river 4 cases. The geographical district, comprising that north of Boston, has had the largest number of individual places infected, and also the largest number of cases. It has been present in Haverhill, Lawrence, Lowell, Lynn, Danvers, Chelmsford, Salem, Beverly, Peabody, Essex, Hamilton, Gloucester and Wakefield. In the Metropolitan district it has included practically all the cities of the district. In the middle part of the State, Worcester, Westboro and Athol have had cases; west of the Connecticut river, Holyoke, Pittsfield and Lenox, and south of the Metropolitan district, Harwich, Attleboro, Fall River, Franklin, Plymouth, Millis and Braintree. So that the disease can be considered as quite widely distributed throughout the State.

It is also of interest to know just what can be done in the cure of cases of the disease. Late in March, from reports received of the treatment of cases in other parts of the country, it was found that such cases treated with diphtheria antitoxine, when used in large amounts and frequent doses, showed a greater rate of recovery than from any other treatment. Consequently the State Board of Health very willingly distributed a large amount of antitoxine during this present month for the treatment of cerebro-spinal meningitis cases, with the understanding that some returns should be sent back to the Board, in order to form some definite opinion as to the results of this treatment. The diphtheria antitoxine has been distributed in amount of over a million antitoxic units, but the returns which have been so far brought back to the State House have been so very slight that no available data is at hand. In the city of Lowell, however, where there have been some 50 cases of the disease, fairly concise records have been taken, and I have analyzed them to present to you. Of these 50 cases 22 were children under 5 years of age, five were from 5 to 10, sixteen were from 10 to 20, six from 20 to 30, and only one over 30 years of age. Thirty-seven were among males and thirteen among females. Twenty-four have died, nineteen have recovered, and seven still remain under treatment. Diphtheria antitoxine has been used in a large number of these cases, and of the twenty-four deaths, seven, or 29 per cent., were of those who were treated with diphtheria antitoxine. Of the nineteen recoveries ten, or over 50 per cent., were treated with antitoxine in various amounts. These amounts of antitoxine have varied from an injection of 3000 units to one of 160,000 units, an amount unparalleled even in the treatment of cases of diphtheria. I am able to say that this case which has received 160,000 units of antitoxine has now been under treatment for nearly a month, and although it has apparently passed the acute symptoms of the disease it has recently developed some unfavorable conditions. One case recovered which had no antitoxine; another case died which had 52,500 units of antitoxine, but the period after he was taken ill before he died was two and one-half weeks. Apparently the antitoxine may have increased the period during which he lived. So that the results of the use of antitoxine, so far as we know, do not offer very favorable recommendations in the treatment of the disease.

As far as the isolation of cerebro-spinal meningitis cases is concerned, we have thought it best, in view of the fact that we know so little about the transmission of the germ, that all cases should be quarantined, that other children in the same family should be kept away from school, and that when death occurs the funeral should be as private as possible. These conditions we consider best to carry out in order to take every precaution which can be taken to prevent the further spread of the disease.

DR. CHASE: Mr. President, just a few words about the experience with cerebro-spinal meningitis in Brookline. We have had since late in January eleven Brookline people who have been reported to have taken this disease. One of those was the case of Mr. Converse, a medical student, who was substituting for a week at the Boston City Hospital, and while there he was feeding a patient ill with the disease and contracted it, and died there. The first four of the Brookline patients died with the disease, and two others of the eleven have since died. The later cases, with one exception, are now well, or getting well. It was interesting to note that in the course of about six weeks seven patients came down with the disease in the most densely populated district in Brookline, an area bounded by Boylston street and Pond avenue, and the mortality was very high there, four out of those seven patients dying of the disease and a fifth is now in a critical, if not a hopeless, condition. We have had now no new cases for nearly two weeks. When the little epidemic, or threatened epidemic, was at its height, our Board of Health prepared a circular of which 2000 copies were sent to the houses in the most congested districts by the police. I will not take your time to read the circular, but I will hand a copy of it to the reporter and it can be published in the proceedings. We think it did some good in the way of getting our people to clean up and keep their windows open and observe other sanitary precautions. We think now that the epidemic is at an end in Brookline.

Dr. Hill asks about the use of antitoxine. All of the Brookline patients, with exception of two who died within about 36 hours of the outset, were sent to Boston hospitals as early as practicable, and all of them received antitoxine treatment, and had lumbar puncture done on them while there. One of those that recovered had antitoxine treatment in Brookline before she went in, but she had it only for two or three days, and recovered at the Massachusetts General Hospital, where they went on with the same treatment. I believe in the value of diphtheria antitoxine in cerebro-spinal meningitis and feel that our State Board of Health has been a help to us in this threatened epidemic by furnishing us this remedy.

TOWN OF BROOKLINE.

Office of the Board of Health,
Brookline, Mass., April 10th, 1905.

CEREBRO-SPINAL MENINGITIS.

To the Citizens of the Town of Brookline:—

Since January 30, 1905, there have been reported to the Board of Health nine cases of cerebro-spinal meningitis. Six of these cases were reported since March 9, and were found in that part of the town lying between 83 Boylston street and Pond avenue.

Since this disease prevails most in the more densely populated districts, where unsanitary dwellings or apartments are most numerous, especially those lacking sufficient sunshine and fresh air, both landlord and tenant should see to it at once that better conditions in these respects are secured. Over-crowding, damp cellars, sunless sleeping rooms, lack of cleanliness, poor ventilation and the presence of dust, all tend to make an epidemic spread. If these conditions are promptly done away with much good will be accomplished, and there will be no reason to apprehend an extensive epidemic.

By order of the Board of Health,

HORACE JAMES,
Chairman pro tem.

H. LINCOLN CHASE, M. D.
Agent, Board of Health.

DR. PIERCE (Milton): I could not help thinking when Dr. Councilman was reading his paper that his theory of the cause for cerebro-spinal meningitis was consistent with the time of year when it most occurs, occurring mostly in the spring months, when we all know that coryza is much more frequent than it is at other times of the year, and also in the cities, where coryza is more common than it is in the country.

VICE-PRESIDENT DURGIN: The Boston Board of Health began its record of cerebro-spinal meningitis in 1897. There were 12 cases reported and 185 deaths in that year. In 1898 there were 30 cases reported and 97 deaths; in 1899, 59 cases reported and 88 deaths; 1900, 52 cases, 66 deaths; 1901, 43 cases, 54 deaths. In 1902, however, after one physician was cautioned as to the neglect in reporting cases, he brought the record up that year with 98 cases reported, and 62 deaths. In 1903 there were 35 cases reported, with 47 deaths; 1904, 44 cases, 37 deaths. But so far in 1905 every case reported has been examined by a physician from the Health Department. We have had during these four months 64 cases and 53 deaths. I think I am warranted in saying of those 64 cases reported and verified that they were very likely cases of cerebro-spinal meningitis.

Are there any more questions or remarks to be made upon this paper?

DR. NOYES: Mr. Chairman, I would like to ask, if it is in order, if anyone knows whether the lumbar puncture and withdrawal of the fluid is supposed to have any effect on the virulence or the course of the disease?

PROFESSOR COUNCILMAN: I think that the opinion is that lumbar puncture certainly does no harm, and that in certain cases it has done a good deal of good in relieving symptoms of the disease. Whether it has anything to do with recovery of the patient I do not know. Dr. Williams, who in 1898 did a great number of lumbar punctures in the disease, felt that it did do good in relieving, for a time at least, the symptoms of pressure.

DR. NOYES: That could be repeated two or three times without especial danger?

PROFESSOR COUNCILMAN: Oh, yes, it has been repeated a number of times.

DR. BOWERS: With reference to that particular question, I can report one case which occurred in South Berlin, near Clinton. The case was attended by Dr. Small of Clinton, and I had the privilege of seeing it in consultation. In that case the lumbar puncture was done twice, and cultures of the fluid showed the characteristic germ. The antitoxine was also used, two injections being given, but I do not know how many units were used. The lumbar puncture was followed by decided improvement immediately, that is, the rigidity and spasm and evidence of pain was immediately relieved, and the child, a boy of four years, was very much more comfortable from that time on and subsequently made a complete recovery.

DR. HUNTRESS: I wish to say that in our present epidemic in Lowell the lumbar puncture has been made in a great many cases, and it has always been followed by immediate relief, but we have come to the conclusion that there is nothing curative about it.

VICE-PRESIDENT DURGIN: Gentlemen, we are twice fortunate this afternoon. I know of no board of health within our section of the country that is not at times bothered to know how to treat cases from a legal point of view. For this reason I have sought the services of a gentleman who has consented to prepare and read a short paper on "Powers of Boards of Health, under Chapter 75 of the Revised Laws of Massachusetts, concerning Offensive Trades and Nuisances." I have great pleasure in introducing Thomas M. Babson, Esq., the Corporation Counsel of Boston.

POWERS OF BOARDS OF HEALTH REGARDING NUISANCES.

By Thomas M. Babson, Esq., Corporation Counsel, Boston.

In discussing the powers of boards of health under Chapter 75 of the Revised Laws, owing to lack of time and the complexity of the subject, I shall confine myself largely to stating general principles and then reading from certain cases showing the application of those principles.

Boards of Health cannot make acts, not prohibited by law, crimes. In morals and ethics certain things which are against the teachings of the Scriptures or of our own consciences are crimes, but legal crimes, crimes which are punishable by the courts, are offences against the laws of the land. Those laws must be passed by legislative bodies having the power under the constitution to pass such laws and prescribe penalties for the breach of them, and a man who is complained of for violation of such laws has a right to be tried before a jury of twelve men, who inquire into all the circumstances of the case and decide as to whether he has or has not been guilty of a crime.

The powers of boards of health, with some exceptions, are powers exercised under the police power, so-called, and in order to have a fair understanding of the extent of the powers of your boards it is necessary to have some idea of what the police power of government is and its limitations.

It being certain that under this chapter boards of health cannot make it a crime for a man to have stagnant water or brown-tailed moths or the nests thereof upon his premises, it follows that the offence which is punishable under sections 65 and 67 of this act is the offence which a particular individual commits in not obeying the orders of a board of health to remove the nuisance or source of sickness from his premises after those particular premises have been examined by the board of health and declared to be a nuisance and a source of disease. In order to understand this, in order to know why each particular case and each particular individual must be dealt with separately, we must know something of the nature of the police power, something of its extent and something concerning its limitations, and I will therefore take up the subject of the police power and will undertake to define it so far as such an intangible and elusive thing has been defined by the courts.

The police power has been defined to be the power to govern men and things so as to extend protection to their lives, limbs, health, comfort and property. Also as the power of government inherent in every sovereignty and necessary to the self-preservation of the body politic.

This right must be clearly distinguished from the administration of criminal law or from police regulations and police authority, nor should it be confused with eminent domain, as has sometimes been done, or with the power of taxation. It is distinct from all of these. It is more despotic and broader in its action than the right of eminent domain, caring for the public health and morals of the community, restraining individuals from interfering with them, and when it is found necessary to take private property under the police power no compensation need be given to the owner unless expressly provided by statute.

It is much easier to realize the instances and sources of this power than to mark its boundaries or prescribe limits to its exercise. The Supreme Court of the United States and the Supreme Court of this Commonwealth, as well as of the other States, have constantly declined to define the limits of this power except so far as was necessary for the determination of the particular cases which were before those tribunals.

As the exercise of this power always tends to destroy or limit the constitutional rights of citizens, the right which they have under our constitution not to have any property taken from them without proper compensation, the right to have their offences passed upon by a jury of twelve men, and even their right of control of their own bodies or actions, it is always a question in every individual case where the police power is exercised whether that particular exercise of the police power is so reasonable and necessary that the constitutional rights of the individual must yield to the inherent right of every community to preserve the lives and health and property of its citizens. I will, therefore, for the sake of illustration, read from some of the cases where some act under the police power has either been declared a reasonable exercise of that power or an unreasonable exercise of it.

1. There is nothing necessarily unconstitutional in a requirement that landowners remove from their own land at their own expense, a nuisance which they neither created nor invited. Familiar examples of the exercise of this power are the statutes requiring the drainage of swamp lands at the expense of the owner, many times held constitutional.

Dingley *v.* Boston, 100 Mass. 544.
Bancroft *v.* Cambridge, 126 Mass. 438.
Nickerson *v.* Boston, 131 Mass. 306.
Davidson *v.* New Orleans, 96 U. S. 97.
Warts *v.* Hoagland, 114 U. S. 606.

For like reasons owners may be compelled to remove snow from the sidewalk in front of their property, although the sidewalks are part of a public highway and the abutters are not responsible for their care.

Goddard, petitioner, 16 Pick. 504.
Remken *v.* Fuehring, 130 Ind. 382
Carthage *v.* Frederick, 122 N. Y. 268.

In some States owners are compelled under penalty of criminal prosecution to exterminate noxious weeds on their lands.

Ill. Crim. Code, ss. 40, 41.
New York, Laws 1878, c. 49.
Agricultural Law, s. 83.

The constitutionality of these particular statutes has never been passed upon by the courts, but the subject has been before the courts, and I quote from an opinion.

The validity of statutes requiring an owner to exterminate noxious weeds, insects or animals on his own land must, like all summary exercises of the police power, rest first on public necessity and second on not undue oppressiveness upon individuals.

Freund, Police Power, ss. 618, 619. "The rightfulness of the requirement to clear land of weeds and pests would depend upon the difficulty and expense of the undertaking. . . . The principle seems to be that where the natural condition of property threatens an imminent danger, which can be averted at reasonable expense or by reasonable restrictions, the owner may be required to do what is necessary to avert the loss."

If the requirement is unreasonable and oppressive, it is unconstitutional.

In *ex parte* Hayes, 87 Cal. 162, the following facts appeared: Ground squirrels were declared a nuisance by the Board of Supervisors of Contra Costa County, and all owners of land were required to exterminate them within 90 days, and thereafter to keep their lands free of them. A penalty for violation was imposed. The court, in its opinion, says:

"We regret exceedingly that we cannot see our way clear to uphold and enforce such an important and original piece of legislation. Indeed, it would give us great pleasure to see the power here assumed applied to snakes, tarantulas, ants, flies, fleas, and other reptiles, insects, and pests, which tend to make man's life a burden, and to have it exercised and enforced in every county in the State. But we are unable to see by what right or authority of law a board of supervisors can impose upon a landowner the burden and expense of exterminating animals ferae naturae on his own land, or elsewhere. . . . Such an ordinance differs materially from laws requiring an occupant of lands to keep them free from noxious weeds, or such as make it the duty of an owner of diseased domestic animals to kill them in order to prevent the spread of the disease. These are matters over which the property owner has control, and the requirements are reasonable and just."

Tiedemann in "State and Federal Control of Persons and Property," commenting on the Hodges case, says (p. 839): "The chief objection to this regulation would seem to be its unreasonableness."

2. If the Legislature or a duly authorized board declares that a certain kind of property or a certain occupation is under certain designated conditions a nuisance, the owner is entitled to be heard on the question whether those conditions exist.

If the Legislature or a duly authorized board declares that a certain kind of property or a certain occupation is, under all conditions, a nuisance, such an enactment is invalid unless it is a reasonable method of dealing with a public evil; but if it is reasonable and consequently valid, an individual affected is not entitled to show that his property or his occupation was not, in fact, a nuisance, but he is entitled to show that his property or his occupation was not within the terms of the enactment.

Belcher *v.* Farrar, 8 Allen 325.

The power vested in a board of health to forbid any trade which is a nuisance or hurtful to the inhabitants is a quasi-judicial power, and its exercise necessarily involves the determination of the question whether a particular trade falls within the category. No notice to the person affected is required by the statute. If the decision of the selectmen were final . . . "it would violate one of the fundamental principles of justice to deprive a party absolutely of the free use and enjoyment of his estate under an allegation that the purpose to which it was appropriated, or the mode of its occupation, was injurious to the health and comfort of others without giving the owner an opportunity to appear and disprove the allegation." But as the statute provided for an appeal to a jury on the whole question it is constitutional.

Commonwealth *v.* Patch, 97 Mass. 221.

Complaint for violation of a regulation of the Springfield City Council acting as a board of health in keeping one swine.

Defendant offered to prove that the keeping of one pig was not in itself a nuisance or a cause of filth. The court ruled that this, if proved, would not constitute a defence.

Held: A regulation of this kind must be reasonable; that is, not interfering with the liberty, property and business of the citizen more than is requisite to secure the lawful and proper object in view. In a thickly-settled city this ordinance was clearly reasonable.

Salem *v.* Eastern Railroad Co., 98 Mass. 431.

Action to recover money expended in clearing the obstructions from a certain pond which the board of health had declared a nuisance.

Held: As far as the removal of the nuisance is concerned the decision of the board is final, although the owner has no opportunity to be heard; but in judicial proceedings consequent thereon, he has a fundamental right to notice, and a hearing and the adjudication of the board is not conclusive.

Taunton *v.* Taylor, 116 Mass. 254.

Bill in equity to restrain the exercise of a trade declared a nuisance by a general regulation.

Held: It is within the power of the Legislature to confer authority on local bodies to act summarily for the protection of the public health. The rights of the person affected are preserved by allowing him an appeal to a jury by whose verdict the order may be altered, annulled or affirmed. The determination of the board of health is quasi-judicial. The allegation in the defendant's answer that the trade which he carried on was not a nuisance, therefore stated no defence which could have availed him at any stage of this cause.

Train *v.* Boston Disinfecting Co., 144 Mass. 523.

Replevin of certain rags, the question being as to the validity of a regulation of the Boston Board of Health requiring all rags imported from foreign ports to be disinfected at the expense of the owner.

Held: There are some things in themselves lawful which become nuisances from the offensive manner in which they are maintained or conducted. The owners of such are entitled to a hearing on the question whether their property is, in fact, a nuisance before they can be put to expense in abating it. But there can be no doubt of the right of the Legislature to pronounce, under its police power, certain things or certain acts, nuisances in themselves, and where anything is declared a nuisance by legislation, it is not competent for a party to show that it is not, in fact, one. The regulation was not unreasonable, and just as certain things may be pronounced nuisances *per se* certain articles also may be made always subject to quarantine regulation.

Langmaid *v.* Reed, 159 Mass. 409.

"A stable used for more than four horses may or may not be a nuisance, but whether it is or not, it is competent for the Legislature to say that it shall not be kept except in such places as the mayor and aldermen of a city or the selectmen of towns may permit and to confer upon a court authority to enforce this prohibition by injunction because stables in their nature are often offensive to the community and the use of them may be regulated by the Legislature."

Newton *v.* Joyce, 166 Mass. 83.

A statute providing that no person shall erect a stable for more than four horses in a city without license from the local board of health is constitutional, although there is no provision for compensation or for appeal from the decision of the local authorities.

Miller *v.* Horton, 152 Mass. 540.

Tort for killing a horse. A statute provided that in all cases of glanders, having condemned the animal infected therewith, the commissioners should kill it without an appraisal. They condemned and killed plaintiff's horse, which did not have glanders.

Held: Assuming that the Legislature had the power to declare all horses afflicted with glanders a nuisance and to order them to be killed summarily without compensation, it has not declared all horses nuisances, and plaintiff is constitutionally entitled to trial by jury on the question whether his horse, in fact, had the glanders. Although the emergency justifies killing the horse, the adjudication of the commissioners is not conclusive on the matter of compensation.

Lawton *v.* Steele, 152 U. S. 133.

A statute prohibiting the maintaining of nets under certain circumstances in the waters of a certain State and providing for the summary destruction of nets set in violation of the statute is constitutional. "To justify the State in thus interposing its authority in behalf of the public, it must appear, first, that the interests of the public generally as distinguished from those of a particular class, require such interference; and, second, that the means are reasonably necessary for the accomplishment of the purpose, and not unduly oppressive upon individuals. The legislature may not, under the guise of protecting the public interests, arbitrarily interfere with private business, or impose unusual and unnecessary restrictions upon lawful occupations. In other words, its determination as to what is a proper exercise of its police powers is not final or conclusive, but is subject to the supervision of the courts."

Applying the principles set forth in these cases to the authority of boards of health under this chapter to deal with estates infested by brown-tail or gypsy moths one is led to the following conclusion,—that an owner may be compelled to abate a nuisance on his own land which he did not create or invite, but only when the compulsion imposes a reasonable burden upon him and the extermination of reptiles, noxious animals or insects has never been held a reasonable burden.

It would seem to follow from one of the cases that the presence of the nests of the brown-tail or gypsy moth on land might make that land a nuisance and cause of sickness so that your boards could take action, while the presence of the moths or caterpillars after they were able to fly or crawl would not justify such action.

Boards of health acting under the authority conferred by sections 65 to 69 of chapter 75 cannot make it a crime to have stagnant water, brown-tail moths, or any other source of sickness upon land. If such a vote was passed it would be unconstitutional, and no man could be punished or fined if the thing declared a nuisance were found on his land.

A board of health must deal with each owner separately and inquire into the state of affairs on the particular parcel of real estate they are considering. If they find a piece of real estate has nuisances, sources of filth or causes of sickness on it which can be removed without inordinate expense, they can order the owner or occupant to remove such nuisances in the exact form set out in the statutes, and if the owner does not remove them he or the occupant is fined for not obeying the order,—not for having the nuisance there, for he may not be to blame for that, but for not removing it when ordered so to do; the tests of the constitutionality of such orders being those given in Lawton v. Steele,—first, that the interests of the public generally as distinguished from those of a particular class require such interference with the rights of the individual, and, second, that the means are reasonably necessary to the accomplishment of the purpose and not unduly oppressive upon the owner or occupant.

VICE-PRESIDENT DURGIN: I have no doubt there are more questions to be asked, and valuable remarks to be made upon this subject. I think we are greatly indebted to the readers, and before we lose those who would be glad to vote with us, I call for a vote of thanks to Mr. Babson and Professor Councilman for their valuable papers.

(The motion was adopted by a rising vote.)

MR. UNDERWOOD: Mr. Chairman, I would like to say a word. Out in our district, in Belmont, we have a great many people who come to us and ask if we will not, as a board of health, pass measures to exterminate the brown-tail moth. There have been boards of health in our neighborhood, notably, the Board of Health, of Watertown, that have passed such an ordinance. We, as a board of health, rather take the ground that Mr. Babson has stated here, that it was not always justice to pass a broad order. It does not seem to me that it is right for boards of health in towns that are situated as our town is to pass a general order compelling all people to remove the brown-tail moth pest from their trees.

In Belmont we have a good many worthy farmers who have large wood lots, who absolutely have not the money nor the time necessary to remove all the nests that there are on their places, and it does not seem right for our Board of Health to pass such an ordinance. It would mean great hardship to those men, and it would generally mean that we would lose a great many acres of wood lot, for they would have to cut the trees down because they would not have the money to care for them. I am wondering if as a board of health we could go to some people who perhaps had the means and would not clear up their property, and say: "Here, you must clear up this property. The brown-tail moth is injurious to health, and we want you to exterminate them." If we say this to a man who has the means to care for his property are we not obliged to treat every one in the same way and oblige other men who have not the money, to clear up the moths? Next year this matter is going to be agitated a great deal more, and I would like to have an opinion on it. I think another year a great many boards of health have got to face this question.

MR. BABSON: I would say that I tried to make it clear in the paper that I wrote that as boards of health have not a right to make crimes, boards of health cannot constitutionally pass a regulation making it a crime punishable by fine under those sections to have stagnant water on a man's land, or to have the brown-tail moth or any other nuisance upon his land.

What the boards of health can do is this: That if a particular man's land, by reason of stagnant water or by reason of the nests of the brown-tail moth, is a nuisance, they can inquire into that particular case, and can order that particular individual to remove that stagnant water or those nests of the moth from his land, and if he does not obey the order, then he is subject to the fines imposed by the statute.

In regard to the other question, police power, as I said, must be exercised so as not to be unduly oppressive to the individual. The court says that broadly, leaving each particular case to be decided as to whether that particular act was oppression or not. It would seem to me, in my opinion, each particular case standing on its own bottom and having to be decided upon its own merits, that if I owned a piece of pasture land or wood land, consisting, we will say, of five acres, worth $20 an acre, or $100 in all, and it would take $1000 to remove the nuisance, whatever it was, from that piece, a court would probably say that that was undue oppression towards the individual, whereas if I owned a piece of land which was worth $1000, and it would cost $100, or $500, or $600, to remove the nuisance from it, as my land, in the condition in which it was, was a menace to the health and comfort of the community, I think it might be constitutional to require me to spend $100, or $500, or $800, or perhaps even up to the value of the land, to take it off. Each case will have to be decided, in my opinion, upon its own merits, because the moment that you undertake to exercise the police power in such a way as to make it, in the opinion of the court, unduly oppressive to the particular individual whom you order to do certain things, that moment—no matter where the line is, the line will be found by the court somewhere—then it becomes unconstitutional. I should think off-hand that the extreme limit which a man constitutionally could be required to expend to get rid of a nuisance on his own land was the value of the land itself; that is, I don't know where inside of it it would fall, but I should think that that would be about the extreme limit that you could go to. You might say that if A has something which is a nuisance and a menace to the health and comfort of society, society has a right to get rid of it; if the man has it, it should be got rid of at any cost to him. If he is unfortunate enough to have a nuisance, why, it may lead to virtual confiscation of that piece of property, but I don't think it could go any farther; I think that would be the extreme limit.

VICE-PRESIDENT DURGIN: Mr. Underwood's question, which has been so clearly answered, is the one about which nine-tenths of the confusion in the community has been caused. The question is as to whether the Board of Health can proceed with an adjudication and order, in dealing with the brown-tail moth, instead of proceeding with each case separately. The Boston Board has been publicly accused of declining to take the former unwarrantable position when called upon, and that afterwards, under pressure, it took that course. Well, we have not done anything of the sort. The board has followed to the letter the instructions given us then, and which you have been given this afternoon by good authority. As I understand it, we are to proceed in the case of the brown-tail moth just as we proceed with other nuisances, that is, to inspect and pursue each case individually, give the order upon the individual owner of premises, and, if necessary, enforce it as in any other case.

DR. HOLDEN: If I understood the speaker, he said that while it might be competent, or was competent, for boards of health to order the removal of the nests of the moths, either the brown-tail or the gypsy, they would not have a right to order the removal of caterpillars. If I understood so, I don't see the difference why there should be that difference.

MR. BABSON: The Supreme Court in this California case found a difference in this, that when animals or things were wild by nature, and were moving constantly, their momentary presence upon a man's land today, which might cease tomorrow and they be over on his neighbor's, might not be a case for the exercise of police power; whereas the fact of the existence of the nests might make the trees and bushes and the land upon which they were a nuisance. The difference found by the court was in this, that the squirrels, the ants, the moths, were able to move and fly around; if they were on the man's land today they might be on somebody else's land tomorrow, and that you could not legislate against that particular man and his particular estate because things were on it which possessed the power of motion and were moving. Whatever the distinction is, it is a distinction made by the courts rather than myself. When these creatures are flying and moving so that they are on this man's land today and spread over the next man's tomorrow, why, it might be difficult on that account to adjudge the man's land a nuisance; whereas, if he allowed things to remain there, like nests on trees, etc., the land might be a nuisance.

(Adjourned.)

VETERINARY SANITATION.

By Veranus A. Moore, M. D. Cornell University, Ithaca, N. Y.

ETIOLOGY OF HOG CHOLERA. In a recent bulletin issued by the U. S. Bureau of Annual Industry, Dorset, Bolton and McBryde have given the details of the investigations into the nature of hog cholera. They have confirmed the preliminary statement made in 1903 that the cause of hog cholera, at least of certain forms of it, is a filterable agent. The sanitary significance of this work is so great that it seems well to quote a few paragraphs from the author's conclusions.

"While our experiments established beyond question that the filterable virus was present in all the outbreaks studied experimentally by us, it is also true that *B. choleræ suis* was present almost as uniformly. So it would be impossible to overlook, even if we were inclined to do so, the part which this organism may have played. But from the results of our inoculations with the filterable virus on the one hand, and our results and those of others with cultures, on the other, we are compelled to conclude that the prime cause in our cases was the filterable virus, and that *B. choleræ suis* was at most an accessory factor.

"The exact role played by *B. choleræ suis* in outbreaks of acute hog cholera is difficult to define. That the fatal result in many instances is materially influenced by the presence of that organism cannot be doubted, and, in addition, we would emphasize the fact that although the filterable virus appears to have been the primary invader, in those cases of acute hog cholera which we have studied, we do not deny the possibility of independent disease being caused by *B. choleræ suis*. In fact, it is difficult to avoid a belief in such a possibility, on account of the very considerable pathogenic power for hogs exhibited by many cultures of that organism when fed or administered intravenously. The filterable virus seems not only to cause disease by itself, as shown by the results of many of our experiments, but it seems also to be able to lower the resisting power of the hog and thus enable *B. choleræ suis* to invade the body, and this we believe takes place in the majority of cases in natural outbreaks. If the filterable virus is capable of lowering the resisting power of hogs for *B. choleræ suis*, then it is easily conceivable that other agencies may also lessen the resisting power of these animals.

"So it must be admitted that a disease in hogs may exist which is due to *B. choleræ suis*, and having no connection with the filterable virus found by us in the outbreaks we have studied. From the knowledge we have of the pathogenic powers of *B. choleræ suis*, however, we would expect that any disease in which it is the chief pathogenic factor would be possessed of a low degree of contagiousness.

"The fact that *B. choleræ suis* was found in a large proportion of the cultures taken from hogs inoculated with filtered serum seems to indicate strongly that that organism has its normal habitat on or in the bodies of healthy hogs, and that in the case of lowered resistance on the part of the hogs this organism enters the circulation. A careful study of the bacterial flora of the hog's alimentary tract might throw considerable light upon this subject."

MUNICIPAL SANITATION.

Charles V. Chapin, M. D., Superintendent of Health, Providence, R. I.

CONTROL OF MEASLES. Newsholme* shows that the fatality from measles is very small after the sixth year of life. In Brighton, under one year of age, the fatality was 25 per cent., while of 270 persons of six years of age and upwards, sick with measles, not one died. He therefore considers it desirable to postpone the date of attack if possible. It is advised that cases of measles be reported by physicians and school officials, and that the well children in the family who have not had measles be excluded from school. Ordinary domestic cleansing suffices for disinfection. The most important means of lowering the mortality from this disease is to discourage school attendance for children under five years of age. Newsholme is very decided on this point, and is strongly of the opinion that the educational advantage to young children is not sufficient to compensate for the expense and attendant evils.

Dr. Niven † does not think that much can be done to restrict the spread of measles. The chief reason for this is, that the disease is exceedingly contagious for several days before it is likely to be recognized. Reports by physicians are not recommended, and he quotes Wheatley as showing that in Blackburn only about half the cases of measles are under medical supervision. Removal to the hospital and disinfection are not of much value. Most can be accomplished through the medium of school teachers. They should be instructed to recognize the initial symptoms of the disease, and exclude all affected until the nature of the illness is cleared up. Children from infected houses should be excluded. When 10 per cent. of the pupils in a lower grade school have been attacked, the school should be closed for three weeks. This will usually terminate the outbreak.

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*Report of Medical Officers of Health, Brighton, Eng., 1904.

†Report of the Health of the City of Manchester, Eng., 1903, pp. 138-159.

The placarding of measles is not common, though it is required in Michigan, New Hampshire, Ohio, and Vermont, and by the rules of several cities in other States. Among the latter, Newton was included, until 1902, when the practice was abandoned. No isolation is required, and it is claimed that 98 per cent. of the cases receive no medical attendance.‡

While most cities are doing little to restrict measles, and some, as Newton, have abandoned former methods of control, New York (Report of the Department of Health, 1902, pp. 181 and 384), has been following a more vigorous policy. Cases were first isolated in 1896, but owing to the negligence of physicians, few reports were received. In 1902, the physicians were called to account for this neglect, many more cases were reported, and strict measures of isolation and disinfection were adopted. The figures given below (for the period since the organization of the greater city, do not indicate any markedly favorable result from the measures adopted:

MEASLES.

	Cases.	Deaths
1898	9,916	651
1899	8,577	587
1900	10,698	816
1901	7,592	449
1902	11,645	710
1903	13,689	508
1904	32,861	895

TYPHOID FEVER AND FLIES. Much has been written about the role of flies in the transmission of this disease, and doubtless they sometimes do act as carriers. Numerous observations and experiments have been made to determine that flies may transmit this disease, but little proof has been furnished that they do. Niven * compared the prevalence of flies and the prevalence of typhoid fever from July 4 to Nov. 28, 1903. The flies were caught in traps, and the maximum was reached during the week ending August 29. During the next four weeks the number of flies diminished over 90 per cent., while typhoid fever steadily increased, the maximum being reached during the week ending November 7. Niven infers that there is no evidence to show that flies are important agents in the spread of typhoid fever in England.

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‡Report of the Board of Health Newton,1902, p. 21 and 1903, p. 12.

DIPHTHERIA AT THE WILLARD STATE HOSPITAL. Drs. William L. Russell and Thomas W. Salmon have recently issued a report † on an outbreak of diphtheria in the hospital for the insane at Willard, New York. Previous to 1897, there had only been one case of diphtheria in the institution, in 1876. In 1897 there was a somewhat limited outbreak lasting from February to July. Twenty-two months later, in June, 1899, another outbreak commenced which continued until July, 1904. This report should be most interesting reading for those health officers who think it is easy to "stamp out" diphtheria. In this institution, for a period of five years, diphtheria prevailed, although the authorities had a far more complete control of all the individuals than they could possibly have in any ordinary community. Absolute isolation and thorough disinfection were insisted on in every case. Release from isolation was permitted only after three successive negative cultures from both throat and nose. Not only were the actual patients isolated, but all persons who carried diphtheria bacilli were subjected to the same restrictions. During the outbreak there were 157 well-defined cases of diphtheria, although more than 10,000 immunizing doses of antitoxine were used. Over 450 well persons were found to be infected. During the outbreak over 100,000 cultures were taken. The number of inmates in the institution during the outbreak was 4345, of whom 3.6 were attacked.

The number of officers and employees was 1141, of whom

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*Report on the Health of the City of Manchester, Eng., 1903, p. 123.

†Reprint from the Sixteenth Annual Report of the New York State Commission in Lunacy.

nearly 10 per cent. contracted diphtheria. Many interesting facts are given in regard to the morphology of the diphtheria bacilli found, and the duration of infection, and in regard to the mode of extension of the disease.

ABATEMENT OF NUISANCES. The city of St. Paul ‡ has adopted a somewhat novel procedure for enforcing its orders. When a property owner fails to abate a nuisance the health department places a placard upon the premises, stating that "These premises are UNHEALTHY and should not be occupied until they are put in a sanitary condition." An ordinance provides a penalty for the removal of the notice.

Every health officer has had trouble with the dump nuisance. One of the chief factors in the production of this type of nuisance is the burning of combustible material upon the dump. Boston has recently ¶ passed an order forbidding the burning "in the open air of any refuse, rubbish or waste material of any description except with a written permit from the Board of Health."

The temporary privy vaults erected by contractors are often a nuisance, and doubtless also the means of spreading infection. In the District of Columbia * no builder can set up such a privy except with the permission and under the direction of the health officer.

Sometimes boards of health are induced to adopt regulations which, however desirable in themselves, have little relation to the preservation of public health. Such a rule is that adopted in Hoboken in 1902, requiring that before a room is re-papered all the original paper must be removed. Rules of this kind are frequently a dead letter, but it is interesting to note that in Hoboken this particular rule is enforced and persons are occasionally prosecuted for its violation.†

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‡Annual Report of the Commissioner of Health, 1903, p. 10.

¶Report of the Health Department, 1903, p. 48.

*Report of the Health Officer for 1902-3, p. 57.

†Report of the Board of the Board of Health for the years ending May 1, 1902 and May 1, 1904.

SANITARY NOTES.

By Robert Spurr Weston, Assoc. M. Am. Soc. C. E.

POLLUTION OF LAKE CHAMPLAIN.* This report of 119 pages was made upon the appeal of the State of Vermont to the National Government to investigate the sanitary character of Lake Champlain with regard to its future use as a source of water supply.

A careful study of the geology of the valley and the appearance of the lake was first prepared and afterwards the effects of the different pulp manufacturing plants and sewage outfalls were carefully considered. The investigations seem to have been carried on in a very able manner; each manufacturing process was carefully studied and the effects of every waste product upon the sanitary condition of the lake were worked out. The results were quite different from popular expectation. The mills do not produce wastes which can seriously affect the character of the lake water, although the waters of the streams on which the mills are located become much polluted. The waste liquors are antiseptic and therefore kill algae and sewage bacteria, though this fact is not often noticed because the dilution of the waste is usually so great.

The pollution of the lake by sewage is a much more important matter, although the pollution is local, not general. Burlington is the chief offender, discharging its sewage into a bay where the water is practically stagnant and drawing its water supply only three miles from the sewer outlet, well within its influence.

The report mentions one amusing incident in the case of a town on one of the mill streams which complained bitterly of the manufacturing waste pollution, as the stream was a desirable source of water supply. Investigations showed that the manufacturing wastes, though unsightly, were not dangerous, while the worst pollution was caused by the sewage of the town making the complaint.

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*Water Supply and Irrigation Paper, No. 121, M. O. Leighton, Hydrographer.

The investigation shows conclusively the greater need for purification of municipal (sewage) rather than factory wastes.

TRAPS OR NO TRAPS. Allen Hazen.†

Mr. Hazen in a recent report on the sanitary condition of the sewers at Winnepeg, Manitoba, corrects many impressions which unfortunately are only too prevalent in many cities and towns. His investigation was caused by the fear of the citizens that the bad odors escaping through the perforated covers of the manholes of the sewers caused the recent epidemic of typhoid fever. According to the English practice, each house connection at Winnepeg is provided with an intercepting trap, precluding any ventilation of the sewer through the house drainage system. Mr. Hazen points out that infectious diseases are not spread by sewer gas and that the bad odor was due to the lack of flushing of the sewers, the low grading of the sewers made necessary by the flatness of the region, the closing of the ventilation outlets of the sewer with straw to prevent freezing, and the fact that all house drains are trapped.

Mr. Hazen recommends that flush tanks should be provided at the ends of sewers and that the use of traps be made optional, thus in course of time, as new systems are installed without traps, ventilating the sewers through the houses instead of through the manholes in the streets. In this way the bad odors would escape at the tops of the houses through the house ventilators, where they would be unobjectionable.

Great care, however, will have to be taken to prevent the closing of the ventilator outlet during the winter, when the moisture arising from the sewer readily freezes on the inside of the vent pipe. Furthermore, care must be taken to keep the plumbing in good condition, that illuminating gas and sewer gas may not get into the house through the drainage system.

Extensive investigations by Colonel Ruttan, city engineer, have shown that the condition of the house plumbing in the city has no connection with the amount of typhoid fever. Winnepeg was formerly supplied with water from the Assiniboine river. This became polluted, and ten years ago Mr. Rudolph Hering advised the adoption of an artesian well supply, the water to be softened before use. The city has grown with great rapidity and the increased consumption of water has made necessary the taking of water from the river, to which cause the prevalence of typhoid is traced.

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†Report on Winnipeg, Manitoba, Sewerage System. Engineering News, March 9, 1905.

In this connection it should be noted that Brockton, Mass., a city of nearly 50,000 people, which is sewered without the use of intercepting traps, has the lowest typhoid fever death rate of any city in Massachusetts of over 25,000 inhabitants.

STATUS OF THE SEWAGE DISPOSAL QUESTION.*

This general paper on sewage disposal gives rather interesting figures, showing that not far from 73 per cent. of the population of the United States discharge sewage into inland streams and lakes, 23 per cent. into the sea, and 4 per cent. through purification works. In his classification of States, the author shows that 75 per cent. of those having the strictest laws are inland States, so that the strictness of the laws is not in every case a measure of the sanitary condition of the State. Rhode Island, classed as one of the worst of the States in this case, treats nearly as much sewage as any other State, and a larger percentage of the population contribute to this sewage than in any other State, except Massachusetts. The author mentions sewage farming as being principally adapted to the Western States. His figures of foreign practice are interesting as showing that the number of persons which an acre of land can take care of varies between 82 and 451. In both these extreme cases the acreage was about the same. In the intermittent sand filtration system from 323 to 1164 persons can be cared for by an acre.

The author points out very clearly the need for selecting the method of treatment best suited to the local conditions and not to use all the available funds in building the system, but to save some for supervising the system.

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*Paper by George A. Johnson, Ohio Sanitary Bulletin, January to March, 1905.

The paper concludes with a description of the Columbus Sewage Testing Station, where the sewage of about 4000 people is received for experimental purposes. At this station contact beds, sand filters, trickling filters with and without settling tanks, and septic tanks are tried, either singly or in various combinations.

IS CHEMICAL TREATMENT OF SEWAGE GOING OUT OF USE? Looking over recent numbers of "The Surveyor," the reviewer is impressed with the fact that a good many of the English cities employing the chemical precipitation method for treating sewage are changing over to other methods. One of the latest changes at Minworth Preaves, England, where the sewage had, until 1901, been treated by chemical precipitation, followed by broad irrigation. At that date the use of lime was stopped and septic action in the settling tanks was allowed to take place. This resulted in a saving of $15,000 to $20,000 a year for lime, and a reduction of 35 per cent. in the amount of sludge without deterioration of the effluent. The additions to this system recently completed consist of septic tanks and filter beds, with aerating and filter beds. The filters are of the trickling type, the sewage being sprayed on the beds.

NEW WATER FILTERS AT PITTSBURG, PA.† One of the largest water filtration plants in the world, and next to the Torresdale plant now being built for Philadelphia, the largest in the United States, will soon be put under construction at Pittsburg, Pa. There will be large settling reservoirs, 46 1-acre covered filter beds, covered clear water reservoirs, large conduits and pumping stations. The arrangement of piping is especially noteworthy, and the plans provide for a central administration building, with laboratories and apparatus for the ventilation of filters and filter galleries when needed. Alternative proposals are invited on scraping the filters and replacing the washed sand by machine and hand.

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†Engineering News, Feb. 16, 1905, p. 173.

SANITATION OF CONTRACTORS' CAMPS. From a sanitary standpoint the most notable of the requirements of the contract relates to the sanitation of the contractor's camp and the health of the workmen. Laborers' quarters must give at least 300 cubic feet of air space per sleeper, must have tight floors at least one foot above the ground. Each camp must have a separate building for a wash-house or laundry, and another for a kitchen or cook-house. Stables must be distant at least 150 feet from the buildings. The workmen must have pure water. Water-closets must be provided and the waste must be treated in tight septic tanks, the effluent from which must be "reasonably clear, colorless, free from disagreeable odor and entirely unobjectionable to run out to a water course." Medical supervision of the workmen is also required. These provisions should reduce to a minimum the danger of a typhoid epidemic, something that is greatly feared by cities undertaking the construction of large reservoirs.

BERLIN AND PARIS SEWAGE FARMS.[‡] The following statistical table states in brief the conditions at the Berlin and Paris sewage farms, respectively:

	BERLIN.	PARIS.
Population by last census . .	2,714,068	1,656,040
Water Supply, gals. per capita per diem .	32	21
Unfiltered water supply, not used for domestic purposes . . .	62	——
Total water supply, gals. per diem per capita	94	21
Area actually under irrigation, acres .	13,100	17,500
Average quantity of sewage applied, gals. per acre daily	12,300	3,530
Number of persons sewered per acre .	207	113

"At Paris the cost of pumping and distributing the sewage, not including interest and sinking fund charges, is $11.30 per million gallons. At Berlin the cost of pumping is about $9 per million gallons and the income from the farms somewhat exceeds the cost of operating them." Small profits have been made at the Berlin farms ever since 1885.

[‡] Allen Hazen, Engineering News, March 16, 1905, p. 285.

SMALLPOX INFECTION BY AIR CURRENTS.¶ In a recent report made to the Local Government Board, Dr. G. S. Buchanan points out the danger of infection by air currents. His investigation was made in connection with the recent epidemics of smallpox at Gateshead and Felling. The Sheriff's Hill Hospital received all the cases within twelve hours after infection. The houses, bedding, etc., were systematically disinfected. The disease seemed to spread from the hospital in the direction of the prevailing winds, and the number of cases was much greater nearer the hospital, though the outer districts were more in communication with the hospital. The effect seemed to be felt with moderate winds for a distance of about half a mile.

TYPHOID FEVER AT LINCOLN, ENGLAND.* In the last number of this journal there appeared an editorial, entitled "Filtration versus Pseudo-Filtration," in support of which is the following example:

Lincoln is a flourishing manufacturing center with a population of about 50,000. Up to April 1, 1904, nearly 900 cases of typhoid had been reported, with about 100 deaths. The municipal water works derives its supply from ponds on the outskirts of the city and from the River Witham, a badly polluted stream, which flows through it. The city authorities have been repeatedly warned of the danger of this latter supply, but the health of the town would have been safe, notwithstanding, but for the fact that the filters became frozen, imperfectly purifying the water, and naturally there resulted the epidemic above described.

¶The Surveyor, January 13, 1905.

*The Surveyor, February 24, 1905.

CANADIAN NOTES.

By John A. Amyot, M. D., Provincial Board of Health of Ontario.

The introduction of a Ministry of Public Health is being seriously discussed in Ontario. It is proposed that this minister have under his control, Immigration, Labor and General Public Health. Under Immigration, he will see that only desirable immigrants as to health and morals enter the Province. Under Labor, he will look after proper hygiene and accommodation in factories, lumber camps, construction camps, and, of course, labor questions proper. Under General Public Health, the enforcement of the Public Health Act, the regulation and inspection of hospitals, asylums and poor-houses.

The new Ontario Cabinet, out of nine members, has three medical men.

Mr. E. C. Whitney of Ottawa has donated $15,000 to be a nucleus for the foundation of a fund towards the establishment of a residence for male students in the Provincial University at Toronto.

The Canadian Anti-Consumption League have been holding a series of meetings at Ottawa. Their chief aim is to combat tuberculosis by the sanitorium method. A petition which has been sympathetically received has been presented to the Dominion Government, asking that model sanatoria be established, one in each Province, to be an object lesson. The Government has been asked, and will probably appoint a Royal Commission to study the tuberculosis problem in Canada.

A pure food society has asked the Legislature to rule that bread must be delivered, each loaf in a paper bag.

There is a project on hand to establish a first-class University Hospital in Toronto. This hospital is to cost $1,000,000, and to be thoroughly equipped.

POLLUTE A WATERCOURSE. Donovan *v.* Township of Lochiel.—Judgment (E.B.B.) in action tried without a jury at

Cornwall. Action for damages for the pollution of a watercourse by means of a ditch which carries the refuse from a cheese factory into the watercourse, and for an injunction. The learned judge finds defendants liable for the nuisance, and assesses plaintiff's damages at $200, and orders that defendants be restrained from permitting any injurious matter to escape from the highway to plaintiff's land and from permitting or causing to flow upon plaintiff's land by way of the ditch or otherwise from the highway any water or other liquid or solid matter which would not naturally have reached it. Defendants to pay plaintiff's costs. D. B. Maclennan, K.C., for plaintiff. J. Leitch, K.C., for defendants.

THERAPEUTICS.

By H. D. Pease, M. D., Director State Antitoxin Laboratory, Auburn, N. Y.

DIPHTHERIA ANTITOXINE IN CEREBRO-SPINAL MENINGITIS. At a meeting of the Medical Association of the Greater City of New York, April 10, 1905, Dr. Wolf of Hartford, who was the originator of the use of diphtheria antitoxine in cerebro-spinal meningitis, read a paper giving his reasons for first undertaking this treatment. Without repeating his arguments it may be said that they did not find any acceptance by those who discussed the paper, including Drs. W. H. Park, James Ewing, E. Libmann, and others. The writer, who was present, agrees strongly with the general trend of the opinions expressed during the discussion. There was also a practically complete unanimity of opinion in the discussion that the injections of diphtheria antitoxine had brought about no material change in the course of the disease in the cases coming under the observation of those speaking on the subject.

ANTISTREPTOCOCCIC SERUM. Bumm ‡ gives a summary of his experience with the antistreptococcic sera of various European producers, in different classes of known and suspected streptococcus infections. He used large doses up to 1000 cubic centimetres. In five cases of puerperal septic peritonitis he obtained no beneficial results. Of three cases of operation peritonitis, two showed no effect from the serum, and one improved rapidly after three daily injections. In two cases of septicaemia with endocarditis, the results were negative, as was also the case in four cases of pyaemia. In fifty-two cases of streptococcus infection of the endometrium, of which 32 were mild in character, five died and 21 were benefited. On the whole, the serum was seldom of benefit in the cases of generalized infections, but was more frequently beneficial in cases of localized disturbances.

Peham * reports upon the use of Paltauf's antistreptococcic serum in 44 cases of streptococcus infection, which he divides into six groups: Of 19 cases of pure streptococcus infections, 1 died; of 14 cases of mixed streptococcus and some other infections, 6 died; of 2 cases in which no bacteriological examination was made, 1 died; of 3 cases in which the bacteriological examination was negative, none died; of 3 cases in which the bacteriological examination was doubtful, 2 died; of 3 cases in which there were serious complications, 3 died. The serum was administered in doses of 100 c. c. The author states that if the injections are not given early in the disease they are useless.

ANTIPNEUMOCOCCIC SERUM. Passler † reports the use of Romer's antipneumococcic serum in 23 cases of pneumonia. The size of the dose varied in size from 10 to 30 c. c., and in number up to four in each case. There were four deaths and 19 recoveries in the series. Of the four fatal cases three were moribund when injected. In ten of the recoveries the crisis occurred after either the first or second injection. In six of the cases the injections had no effect on the temperature.

Anders ‡ has published a critical summary of the literature on the use of antipneumococcic serum in 535 cases of lobar pneumonia with an average mortality of 18.3 per cent. The author states that the results do not carry conviction as to the usefulness of the remedy.

ANTIDYSENTERIC SERUM. Kanel¶ results obtained from the treatment of 130 cases of acute dysentery, chiefly adults, treated at Moscow in the summer of 1904. Of these 21 cases were mild in character. In eleven instances bacteriological examination showed the presence of the dysentery bacillus in the stools. At first he used doses of 20 c. c., but later doses two or three times that size were administered. The mortality was 3 per cent., and if moribund cases are eliminated it was 2 1-3 per cent. According to the author, the serum injections did not appear to influence the temperature, but had a marked effect on the number and character of the stools. The duration of the disease was shortened.

ANTI-ANTHRAX SERUM.* Legge has recently published a critical summary of the work of Sclavo, and those who use the latter's method of preparing anthrax immune serum. Legge states that Sclavo and Soberheim have produced an effective serum by the injection of sheep and asses with cultures of anthrax bacilli while at the same time, or previously, the animals received anthrax immune serum intravenously. According to these workers, this serum acts effectively as a prophylactic agent in cattle and in man. In 164 cases of external anthrax in man treated with Sclavo's serum the mortality was about 8 per cent. as compared with 24 per cent. for all cases occurring in Italy at the same time. Legge says the serum is harmless given intravenously, even in large doses of from 30 to 40 c. c., or larger. The editor of this section, after reviewing the recent literature on the subject of the therapeutic value of antistreptococcic, antipneumococcic, antidysenteric and antityphoid sera, feels but little hesitancy in stating his opinion that in no one of these diseases has there yet been demonstrated an entirely satisfactory serum therapy. Further scientific observations in the subjects of immunity and the differentiation of bacteria will be required before any great improvement can be expected.

THE INTRAVENOUS INJECTION OF ANTITOXINE DIPHTHERIA. Biernacki and Muir † treated 45 cases of diphtheria by intravenous injections of diphtheria antitoxine. They divided the cases into two groups of seven, and 38 cases respectively. The first group was virtually selected from a service of 334 cases of diphtheria. From the histories given one is led to conclude that they were all of a very severe type. Five cases ended fatally. The doses used varied from 12,000 to 40,000 units, and in two instances at least general anaesthesia was employed. In three instances a chill and rise in temperature followed. In the second group of 38 cases the disease was also severe, but there were but three deaths. While the authors conclude that it was difficult to say of any individual patient that a better result was obtained than might have followed subcutaneous injection, they admit that the total result in group two is a good one. The impression one gains from reading the article is one of the questions as to the influence which the methods of producing anaesthesia exerted upon the final termination of some at least of the cases. In one fatal case in group two the authors state that the anaesthetic was badly taken. The rigor and chill following three cases in group one would also indicate a possibly bad influence of general anaesthesia. The question might well be raised whether general anaesthesia is at all necessary for such a minor operation as the intravenous injection of 50 cubic centimetres or less of serum.

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JOURNAL OF THE
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[The Association as a body is not responsible for statements or opinions of any of its members.]

VOL. XV. (New Series. Vol. I., No. 4.) August, 1905. NO. 3

THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH was organized in Boston, March, 1890, *with the following objects; The advancement of sanitary science; the promotion of better organization and co-operation among local boards of health, and the uniform enforcement of sanitary laws and regulations*

THE JOURNAL OF THIS ASSOCIATION has for fifteen years faithfully reflected the views of the public hygienists of Massachusetts. With the November issue of the year 1904, *the encouragement received from many hygienic quarters induced the Association to undertake the expansion of the Journal to a national standard, with the co-operation of many noted sanitarians as editors. A new title was selected, while the older and well-established title was retained also.*

The dates of publication are FEBRUARY, MAY, AUGUST *and* NOVEMBER *of each year.*

THE JOURNAL will contain the papers read at the meetings of the Association, papers contributed by hygienists, reports of the discussions, editorials, abstracts, reviews and hygienic notes of professional interest. Subscription rates, $1.00 *per year. Reprints furnished at cost price.*

All communications concerning the JOURNAL, copy, proof, subscriptions, advertisements, etc., should be addressed to the Managing Editor, DR. H. W. HILL, 739 *BOYLSTON ST., BOSTON, MASS.*

All communications concerning the ASSOCIATION should be addressed ta the Secretary of the Association, JAMES C. COFFEY CITY HALL, WORCESTER, MASS.

All bills not relating to the Journal, and MEMBERSHIP DUES ($2.00 *per year), should be sent to the Treasurer of the Association, DR. JAMES B. FIELD,* 329 *WESTFORD ST., LOWELL, MASS.*

EDITORIALS.

THE COMING MEETING OF THE AMERICAN PUBLIC HEALTH ASSOCIATION.

The American Public Health Association is to meet in Boston, September 25-29 of this year. The Laboratory section meets September 25; the main association, September 26-29. Dr. H. P. Walcott, president of the Massachusetts State Board of Health, and of the Massachusetts Association of Boards of Health, is chairman of the local committee of arrangements. Membership in the association is open to all interested in public health matters; but the association is largely made up of public health officials, Federal, State, Provincial and Municipal, from the various parts of the United States, Canada, Mexico and Cuba. The association is international in scope, and is the oldest, largest and most influential hygienic association in the Western Hemisphere. Its list of ex-presidents is practically a list of the most prominent official hygienists of the four countries since 1872. New England has contributed its quota of presidents, Drs. H. P. Walcott and S. H. Durgin of Massachusetts, Dr. Henry D. Holton of Vermont, and Dr. C. A. Lindsley of Connecticut. Nothing related to public health is foreign to the discussions of the association, and its thirty-three annual volumes of transactions contain an immense amount of valuable material.

The Laboratory section of the association, which has been prominent in the last few meetings, was designed to provide a rendezvous for the reading and discussion of the technical papers relating to the laboratory work which has become so important an item in modern public hygiene. To this section papers of all kinds dealing with chemical and bacteriological matters have been contributed; covering the subjects of diagnosis, technique, analysis of foods, water, sewage, disinfectants, milk, antitoxins, mallein, etc., etc. The section has taken up the work of establishing uniformity of methods for such work. The work of the committee on standard methods for water analysis is the most complete and authoritative of those so far attempted, and has met with wide scientific approval here and abroad. A committee on standard methods for diagnostic work now exists, and will devote itself to doing for this branch of hygienic work what the water analysis committee has already done for its subject.

The officers of the Association for the Boston meeting are: President F. F. Wesbrook of the University of Minnesota, and the Minnesota State Board of Health, an honorary member also of the Massachusetts Association of Boards of Health. The vice-presidents are: Dr. Juan Guiteras, Havana, Cuba; Dr. Fernando Lopez, Mexico, and Dr. John A. MacDonald, Brandon, Manitoba. The secretary is Dr. Charles O. Probst, of the Ohio State Board of Health, and the treasurer, Dr. Frank W. Wright, of the New Haven (Conn.) Board of Health.

The Chairman of the Laboratory Section is Dr. W. H. Park, Bacteriologist to the New York City Board of Health; the vice-chairman is H. W. Clark, Director of the Water Laboratory of the Massachusetts State Board of Health. The secretary is Dr. John S. Fulton, secretary of the Maryland State Board of Health, and the recorder is Dr. H. D. Pease, director of the New York State Antitoxin Laboratory, Albany, N. Y. Many of these gentlemen are already familiar to the readers of this Journal as contributors to its columns.

The coming meeting is especially of interest to public health officials because of the special attention which will be paid to the discussion of methods of training health officials, the institution of a degree for those engaged in such work and the advancement of public hygiene along systematic scientific lines to a greater extent than ever before, ensuring a closer co-operation between executive and scientific public health workers. The University of Toronto and the University of Pennsylvania have already organized courses for medical health officers. Harvard is about to engage on similar lines. The Massachusetts Institute of Technology has for some years provided special courses for sanitary engineers. It is generally hoped that the Boston meeting will inaugurate new ideals and new systems of work in public hygiene, which will help to carry into practice the ideas evolved by the Association and its leading members during the 33 successful and faithful years of its existence.

The program, consisting wholly of original papers and discussions on executive and technical public hygiene, promises to be of the greatest interest. The readers of this Journal are strongly urged to attend the meetings of this Association, the times and places of which will be duly set forth in the daily papers.

REPORTING OF OPHTHALMIA.

The Legislature of Massachusetts has recently provided by statute for the reporting of all cases which simulate Gonorrheal Ophthalmia in new-born children, with the object of placing upon Boards of Health the work of preventing some part of the blindness so prevalent as an aftermath of this disease. The law differs from that relating to other infectious diseases in that it does not require a report from the physician after he has made a diagnosis, but describes certain specific symptoms, and demands that the presence of these symptoms shall be reported. This peculiarity of the statute widens its application to a point where the responsibility of diagnosis and treatment are placed directly upon the Board of Health. So far as the writer is aware, this is the first legislation of this kind in Massachusetts. In the other infectious diseases the Board of Health, in the effort to meet the requirements of modern public hygiene, offers facilities for diagnosis and isolation, where these are not provided already, but in this case it seems to have been the object of the act to make diagnosis and treatment a specific statutory duty.

In accordance with the spirit of the statute, the Boston Board of Health has directed that the following circular be sent to all physicians in Boston, and that the Boston Board of Health Laboratory should make immediate provision for the examination of material for diagnosis from the eyes of the suspected patients, with the object of determining the presence or absence of the gonorrheal organism. We append here a copy of the circular to physicians and of the directions which go with the outfit devised for the bacteriological examination of the eye.:

HEALTH DEPARTMENT.

OLD COURT HOUSE.

Boston, July 15, 1905.

The attention of physicians and nurses is respectfully called to the following sections of chapter 251, as *amended* by Acts of 1905:

> *Section 49.* A householder who knows that a person in his family or house is sick of smallpox, diphtheria, scarlet fever or any other infectious or contagious disease dangerous to the public health shall forthwith give notice thereof to the Board of Health of the city or town in which he dwells. Upon the death, recovery or removal of such person, the householder shall disinfect to the satisfaction of the Board such rooms of his house and articles therein as, in the opinion of the Board, have been exposed to infection or contagion. Should one or both eyes of an infant become inflamed, swollen and red, and show an unnatural discharge at any time within two weeks after its birth, it shall be the duty of the nurse, relative or other attendant having charge of such infant to report in writing within six hours thereafter, to the Board of Health of the city or town in which the parents of the infant reside, the fact that such inflammation, swelling and redness of the eyes and unnatural discharge exist. On

receipt of such report, or of notice of the same symptoms given by a physician as provided by the following section, the Board of Health shall take such immediate action as it may deem necessary in order that blindness may be prevented. Whoever violates the provisions of this section shall be punished by a fine of not more than one hundred dollars.

Sect. 50. If a physician knows that a person whom he is called to visit is infected with smallpox, diphtheria, scarlet fever or any other disease dangerous to the public health, or if one or both eyes of an infant whom or whose mother he is called to visit become inflamed, swollen and red, and show an unnatural discharge within two weeks after the birth of such infant, he shall immediately give notice thereof in writing over his own signature to the Selectmen or Board of Health of the town; and if he refuses or neglects to give such notice, he shall forfeit not less than fifty nor more than two hundred dollars for each offence.

[*Approved March 31, 1905.*

Outfits for taking cultures from the eyes will be found at all of the culture stations, and further information may be obtained from the Board of Health, or the laboratory at 739 Boylston Street.

By direction of the Board of Health,
C. E. Davis, Jr., *Secretary.*

GONORRHEAL OPHTHALMIA. — DIRECTIONS FOR MAKING SMEARS.

This outfit contains two glass slides, two sterilized wire loops, in envelopes; a card to be filled out by the physician and these directions:

(1) Use a separate outfit for each patient, and a separate wire loop for each eye of each patient to avoid chance of infection from eye to eye.

(2) The fingers of the operator should be carefully disinfected.

(3) Place a small drop of water on one of the slides at the end away from the label.

(4) Draw down the lower lid of one eye and insert a loop (first bending it to a convenient angle) flatwise between the lid and eyeball.

(5) Pass the loop sidewise along the inner surface of the lid to secure a drop of any matter which may be present.

(6) Rinse the loop in the drop of water and spread the drop out thin. Sometimes more material may be found on inspection under the upper lid. A similar operation to the above will secure this also.

(7) Return the used loop to the envelope from which it came.

(8) Disinfect the fingers carefully, then use the second, and as yet uninfected, loop, to prepare smears as above from the second eye. Return the second loop to its own envelope.

(9) Write the patient's name and the eye examined (right or left) on the slide label.

(10) Allow the smears to dry; gentle heat may be applied to hasten the process. When thoroughly dry, place the slides together, back to back, and repack them in the slide box. Fill out the card and replace card, slides and small envelopes in the large envelope, which may then be mailed to the laboratory.

JULY QUARTERLY MEETING

OF THE

Massachusetts Association of Boards of Health.

The quarterly meeting of the Massachusetts Association of Boards of Health was held at Gallup's Island, Boston Harbor, on Thursday, July 27, 1905, by the courtesy of the Boston Board of Health. The First Vice-President, Dr. Samuel H. Durgin, presided in the absence of the President, Dr. H. P. Walcott.

The records of the April meeting, which was held at the Brunswick Hotel, Boston, were read and approved.

The following members were elected, a single ballot being cast for them on motion of Dr. Denny after the Executive Committee had endorsed their applications:

Dr. E. Alden Dyer, Whitman.
Dr. William D. McFee, City Physician, Haverhill.
W. O. Johnson, Clinton.
F. W. Taylor, Cambridge.
Dr. Rufus H. Hall, Everett.
George C. Bunker, Bacteriologist with D. Whiting & Son.
Dr. William F. Donahue, North Cambridge.
Dr. Albert P. Norris, Milk Inspector, Cambridge.
Dr. William C. Hanson, Cambridge.
Dr. T. B. Alexander, Scituate Harbor.
Dr. Joseph Frame, Rockland.
Judge George W. Kelley, Rockland.
Gurdon W. Gordon, Springfield.
Dr. T. F. Reardon, Springfield.
F. B. Allen, Springfield.
Almon Jones, Springfield.
H. W. Mason, Springfield.
A. C. Atchinson, Springfield.
H. A. Cook, Springfield.
H. J. Tait, Springfield.
Dr. Daniel C. Rose, City Physician, Stoughton.
Dr. John Shanahan, Peabody.

THE VICE-PRESIDENT: Dr. Hill has something to say concerning the Journal.

DR. HILL: Gentlemen—Under the present Journal contract, which calls for a subscription of 75 cents per head from members of this Association (the price for non-members remaining $1.00, as usual), the members' subscriptions being included in the Association fee of $2.00, the Journal has become solvent, and I see no reason why it should not remain so. Our income, conservatively estimated, from the three sources of members' subscriptions, outside subscriptions and advertisements, does now and ought to continue to exceed the expenses of publication by about

$100 a year. This or any other surplus, under the terms of the contract, is to be returned to the Association; the contract specifically providing that no one concerned in the management of the Journal but the Association itself shall secure any financial profit from it. The reason why there is not at this moment a surplus of about $100 ready to be turned into the Association treasury is that this surplus was used to make good a deficit under the previous contract. Since, under the previous contract, the Association might have been called upon to make good this deficit, the Association has lost nothing to date—indeed, it has gained the interest on about $100 for a year.

I wish to ask for instruction from the Association as to the disposal of 600-800 copies of an exhaustive index of the first twelve volumes of the Journal. This index was prepared by Dr. S. W. Abbott, with his usual care and detail, constituting almost the last of his contributions to the successful conduct of this Association and its Journal. The final disposition of these has never been passed upon by the Association, and, while I have acted as their custodian, I have never had authority to do anything with them.

Dr. Chase: Apropos of the Journal, I would like to say that I think it would be an excellent thing if some one in each of the cities and towns represented here should recommend to his Public Library for the table of the reading room a copy of our Journal, now called the American Journal of Public Hygiene. A few days ago I made the recommendation to our trustees in Brookline that they subscribe to it. It costs only $1 a year, and it is now of such a nature that it will be appreciated by almost every person of intelligence who takes it up.

The Vice-President: It might be well, it seems to the Chair, to relieve Dr. Hill of the custody of these volumes by turning them over to the Secretary of the Association, and then the Secretary may be called upon at any time by members who want copies. If there be no objection, I will recommend that the copies be turned over to the Secretary, who will hold them for any call by members of the Association.

Are there any resolutions or any other business to come before the meeting.

DR. CHASE: Mr. Chairman, a great many years we have been regularly invited to this place for the July meeting, through the courtesy of the Board of Health of Boston, and we have not always remembered to thank them for their courtesy. I make a motion that we tender the City Government of Boston and the Board of Health of Boston a vote of thanks for their courtesy, for their entertainment today and the trip down the harbor.

THE VICE-PRESIDENT: The question is asked where the American Public Health Association meeting is to be held in September. We have not been able yet to select the hall, but the meeting will be held in Boston, in the best accommodations that we can find. There will be an announcement given, and that will be published in the newspapers at the time.

We are very fortunate today in having a man with us who knows all about one of the greatest pests in Massachusetts, and who will have charge of the work to be done during the next few years in the destruction of the brown tail and gypsy moth in this State. I have great pleasure in introducing to you Mr. Kirkland.

MR. KIRKLAND: Mr. Chairman, Members of the Association, I wish that I really did know all about this pest proposition, as your Chairman has so kindly said, because then I would know how the State is coming out two or three years from now in the matter, and how much help and co-operation we are to have from the people. But I assume that we are coming out all right, and I feel sure of co-operation all along the line.

THE MOTH PESTS AS PUBLIC NUISANCES.

By A. H. Kirkland, State Superintendent of the Work against the Moths.

The occurrence of the brown tail and gypsy moths in overwhelming numbers in certain sections of Eastern Massachusetts has added two new public nuisances to the burdens already borne by our communities. While obnoxious and injurious in the highest degree for several years past, they have but recently been given legal standing as public nuisances. This was accomplished by Chapter 381, Acts of 1905, wherein special legislation looking to their suppression has been enacted. The subject is a timely, one might almost say a burning, one, and in the short time at my disposal I hope to cover the essential features of the working of the new law as applied to these pests.

THE BROWN TAIL MOTH.—The eggs of this insect are laid during the latter half of July, particularly on the foliage of fruit trees and to some extent on shade trees. When the eggs hatch, the small caterpillars immediately commence to feed and also to form their winter webs, weaving them out of silk with the remains of leaves previously fed on. By the time cold weather arrives, these webs—conspicuous objects at the tops of trees—are from two to six inches long and contain about 250 caterpillars each. In April the webs are vacated by their inmates, the caterpillars feeding first upon the buds and later upon the foliage. As they approach maturity, they acquire the wandering habit, although it is often the case that a complete defoliation of a number of trees forces a wholesale migration of the insects. At this time human beings are often poisoned by coming in contact with the caterpillars. By the last of June, cocoons are spun in foliage at the ends of branches, under fences, etc., from which the white, brown-tailed moths emerge about July 12. This in brief is the life history of the pest. The injury to fruit and shade trees by the caterpillars is a matter of common knowledge, but this, of course, is hardly to be compared with the intense burning or nettling caused whenever the caterpillars come in contact with human flesh. So far as our studies have gone, this irritation or Dermatitis seems to be the result of the mechanical irritation following upon the penetration of the brittle, finely barbed hairs into the lower layers of the skin. Further studies on this point, however, should be made. The use of cooling lotions seems to be the best remedy.

THE GYPSY MOTH differs somewhat in its life history, in that the eggs are laid on tree trunks, rocks, fences, etc., instead of upon the foliage. The caterpillars hatch the following spring, when they proceed to feed upon all kinds of fruit and shade trees, the foliage of which they devour with the greatest rapidity. Injury from the gypsy moth is principally confined to the defoliation of trees, although numerous cases have occurred where the caterpillar swarms have invaded houses and made themselves a nuisance generally. When the caterpillars are fully grown, they change to pupæ, usually on the bark of trees, under fences, etc., and by the latter part of July the brown males and white females emerge.

The differences between the two species worthy of emphasis. The brown tail moth eggs are laid on foliage; the gypsy moth eggs on tree trunks. The brown tail eggs hatch in the fall and the caterpillars hibernate half-grown in a winter web; the gypsy eggs do not hatch until spring. The brown tail caterpillars are the cause of the painful nettling so common during an outbreak of this insect; the gypsy moth caterpillars do not cause any nettling worthy of mention.

REMEDIES.—For the brown tail moth, cut off the webs during the winter and burn them. This may be done by using pole shears, and where thoroughly executed will give immunity from the caterpillar plague the following season. For the gypsy moth, search out the egg clusters and soak them with crude coal-tar creosote any time during fall, winter or spring. Both kinds of caterpillars are easily destroyed by spraying the foliage with arsenical poisons, and the gypsy moth caterpillars, when half grown, assemble in large numbers beneath burlap bands placed around tree trunks.

DISTRIBUTION.—The distribution of the brown tail moth has greatly increased in recent years because the moths fly freely and are often borne long distances by the wind. The moth is known to occur from Cape Cod northwestwardly to Amherst and easterly as far as Eastport, Maine. Its region of most severe injury in this State will be contained within a radius of twenty miles from Boston. The gypsy moth occurs from Randolph on the south to Framingham, thence to Andover and Salisbury. The region of principal gypsy moth injury is found within twenty miles of Boston on the northern side. No serious injury is yet developed south of Boston.

By the new law against these pests, they have been declared public nuisances and their suppression is required. This work may be done either by a board or official of a city or town. Each municipality is required to make an appropriation for the work, based, within certain limits, on its valuation. When the work of suppressing the moth has been done to the satisfaction and under the direction of the State Superintendent, each municipality is reimbursed a certain percentage of its expenditure. The municipality is made responsible for the enforcement of that section of the law which requires private owners to destroy the moth pest on their property. The owner's liability is limited to one-half of 1 per cent of his valuation, an amount usually sufficient to free an ordinary estate from the pests. Suitable penalties are provided for refusing to comply with the terms of the law or obstructing properly authorized agents in their attempt to carry out its provisions.

Such in brief is the situation as we find it today with reference to systematic work against these pests. The task before us is a gigantic one, but, if the hearty co-operation of all city and town officials and all good citizens can be had, the matter can in time be brought to a successful termination. Without such co-operation little can be accomplished.

DR. COGSWELL: I should like to ask in what stage of the insect parasites are supposed to prey upon it. In the caterpillar stage or the moth stage?

MR. KIRKLAND: There are probably no insect parasites that attack the winged moth. The principal parasites work on the caterpillar and on the pupæ. Then, in the case of the brown tail moth, we find there are a lot of European parasites in the winter nests, insects that get in there and propagate, principally in the late fall and early in the spring.

PROF. THEOBALD SMITH: I would like to ask Mr. Kirkland why these two moths differ so from the myriads of other moths that abound, and why they should multiply so and be so destructive. Is there any difference betweeen our locality and the localities in other countries where the moths also exist? Can he explain this remarkable multiplication of these insects in this locality?

MR. KIRKLAND: Mr. Chairman, it is the old story of disturbing the balance of nature. These pests, the gypsy moth and brown tail moth, in their native region, which practically amounts to the temperate zone of Europe, are held in check by, say, sixty insect parasites, three or four fungous diseases, about forty or fifty birds, and about a dozen beetles. Nature has provided all those checks on them at home. Over there occasional outbreaks occur, which run three or four years; then subside. They are comparable to the canker worm outbreaks we have here. The moths were brought here with all those checks left behind, and our native birds, and our native parasites, and our native fungous diseases, have not adapted themselves in this brief period to preying on the gypsy moth or the brown tail moth. It is practically the same story as with the English sparrow. The sparrow was brought over here, without its natural checks, and has become a tremendous nuisance. We hope by importing parasites to restore this balance of nature, as we say, so that we shall have the European enemies of the moth here, and when the moth gets to be over-abundant the parasites will have a wealth of food to which they are adapted by nature structurally; they will prey on the caterpillars, sting them, feed on them, and the next year we shall have a big army of parasites and a very few moths. Then the balance will shift. That is what we are hoping for, and that is the reason why the moth is so much more injurious here than at home; simply because it was imported without its natural enemies.

The Vice-President: We are also fortunate in the discussion of the subject. Shall we hear from Professor Smith?

Prof. Theobald Smith: I think our Chairman has the faculty of seizing the psychological moment in great problems of the day, and bringing them up for discussion at these meetings; but I regret to say that in calling upon me he has chosen one who knows nothing about the subject, and who simply came here to learn. I think, however, that there are certain general lessons that we can draw from this very interesting phenomenon that Eastern Massachusetts is passing through at the present time.

There is a marked similarity between the multiplication of these insects and the infectious diseases. This phenomenon, I think, can be very thoroughly apreciated by health officers, who are daily, throughout the year, fighting invisible enemies in the shape of the micro organisms which destroy human lives. I think that bringing up such a question in an assembly such as this is especially fruitful, because those who are concerned with the public health know that it is necessary to fight these enemies with every weapon in their control, to fight them, as it were, with their own hands, and not to depend too much upon agencies which have as yet been untried, such as the parasites which are now being collected in different parts of the world to be sent over here. The work of destroying these insects is one which has to be carried on largely by individual and co-operative effort, and wherever these organisms are found they should be destroyed. It would be very unwise, it seems to me, from all that we know of the laws of parasitism, to depend too much upon the destruction of these enemies simply by parasites. I think the laws of parasitism tell us this, that no parasite ever completely destroys its host, because that would be killing the goose that lays the golden egg. Parasitism only goes to a certain point The parasite does not destroy its host, but simply troubles him and disturbs him. As Mr. Kirkland has said, if a large number of these parasites were introduced and could be made to develop under our conditions, these pests would be kept down, but they probably would not be wholly destroyed, because if they were the parasite would have nothing to feed upon. We must always remember that the host is the home of the parasite.

It seems to me that for this reason we all are interested in the destruction of these pests. They have, of course, only an indirect bearing upon the public health. The irritative inflammation which they produce cannot be considered a very serious matter from a public health standpoint, and perhaps needs hardly to be considered, but the whole matter is one of great interest, because animal life in all its forms is coming to represent more and more to us as health officers. I need only speak of two insects that have within ten years come to the foreground on account of their relation to the public health.

Ten years ago it would have been considered absurd for anyone to stand here and say that the mosquito had anything to do with malaria. Even nine years ago, perhaps even eight years ago, the malarial parasite was regarded as living in the soil, and whenever the soil was turned over it was supposed to be set free in the air and become disseminated. During these eight years tremendous changes have taken place in our conception of certain diseases caused by insects, and today nobody would think of looking in upturned soil for the parasite of malaria. It was always an absurd proposition on the face of it, but it held its sway for a great many years. Now we know that the malarial parasite is carried by infected individuals, and that it is transmitted by insects, and this has given great impulse, not only to the study of this insect, but it has aroused interest in the whole subject of entomology among students of disease.

Another insect that is receiving more attention today from a public health standpoint is the common house fly. It breeds preferably in horse manure, and we know that flies are attracted by all sorts of decomposing material. In working in the laboratory with cultures which have a certain offensive odor, it is almost impossible to keep the flies away. They seem to be practically intoxicated by the odor of decomposition. Now, we know that flies will consume all sorts of material. They will consume sputa very rapidly. They will consume all preparations in the laboratory that we may make, unless we watch them very carefully. The tubercle bacilli will pass through their intestines and come out largely unharmed. Typhoid bacilli are also now regarded as being carried by the fly in some epidemics.

At the present time, therefore, these two insects we guard against, or should guard against, in our public health work. We should see that flies do not come in contact with our food supply and thus disseminate the germs of infectious diseases. As I said a moment ago, ten years ago entomology had no standing in public health or in pathology, but today it has, and the interesting paper which we have heard today is another indication of the importance which entomology bears to the well being of humanity.

The Vice-President: We are also fortunate in the presence of another expert. Shall we hear from Mr. Underwood?

Mr. Underwood: Mr. Chairman and Gentlemen, I have listened with a great deal of interest and much profit to what Mr. Kirkland has had to say about these insect pests. In Belmont, where I live, the brown tails and gypsies have been residents for some time, and I can not help being somewhat concerned regarding this question, especially as I have about two hundred trees upon my place, in which the brown tails and gypsies are quite interested. It almost seems this summer that they have taken much more interest in them than I have. In looking into this subject and in trying to keep the foliage on my trees, I was struck by one particular thing—I was struck in the neck, so to speak—whenever I went near a tree where there were any brown tail moths I was struck with this itching brown tail rash. We have been told, and Mr. Kirkland has said today, that in his opinion he did not think that the moth had very much to do with this rash; that it was caused only by the hairs of the caterpillars. I think that in my case the moth had a good deal to do with the itch, and I can perhaps prove to you that the female moth has a good deal to do with it. Of course the caterpillars do cause the itch, we all know that; but with me, at least, I get a very much more severe irritation from the hairs of the female moth. Let me tell you my experience.

I had always regarded that the moths had nothing whatever to do with the rash, but during the flight this July, that Mr. Kirkland has told you of, when they were flying about the electric lights, I went out in the evening to collect some of them. I was standing under one of the lights when, with a thump and a buzz, a moth went down under my collar. I immediately pulled it out, and found that it was a female, with the characteristic tuft of brown hairs on its tail. I did not anticipate any trouble, but within five minutes I had a very severe irritation and itching between my shoulders. When I retired that evening I found by actual count twenty-seven white welts, about the size of a cent piece, on the back of my neck and down to the midddle of my back. Bicarbonate of soda was put on. I have found, by the way, that this is a very excellent remedy. In the morning the irritation had disappeared. But I became very suspicious of these moths. Every evening afterwards when I went out if I stayed about the lights where the moths were flying I was poisoned.

One morning I was bold enough to take a brown tail moth and to touch it to my wrist in the presence of somebody who said that they did not think that the moths had anything to do with the itch. I took this moth—and I have one with me now, and would be willing to do it again, if anybody would like to see it done—and touched it to my wrist. Inside of a minute I had a very severe burning sensation. Inside of two minutes I had a white welt as big as a quarter of a dollar. Inside of an hour I thought I was a fool, because my arm had swelled up almost to my elbow. Several times since then I have taken the hairs from the tail of a moth with very fine forceps, just as few hairs as you could see with your naked eye, and put them on my wrist or others' wrists, and have produced the irritation. I have made the experiment within the last ten minutes and have the irritation now upon my arm.

It seems to me that the hairs which make this trouble come from the tail of the moth itself, and that it cannot always happen that the hairs of the caterpillar get on to the moth when it emerges from the pupa. Of course, it is possible that when the moth comes from the pupa some of them may carry off some of the caterpillar hairs, because the empty skin that has been shed by the caterpillar is near the pupa, and the hair is all about it. That, of course, in itself would make the moth dangerous if their own hairs were not, because the moths that fly around with caterpillars' hairs upon them are just as bad as though their own hairs were concerned. In my opinion, every female brown tail moth is capable of inducing the rash with some of her own hairs.

I have here some photographs, which I have taken in the last two days, that perhaps you may be interested to see. They show the hairs from the brown tail caterpillar and from the moth, and they show that the hairs from the tail of the female brown tail moth are barbed and very fine. I have in this box a female brown tail moth that was in the act of laying its eggs, when I put benzine upon it and killed it. This egg mass is not normal, as you will see when I pass it around. Before she died she spun this little roll, as it were, of eggs. I am not an entomologist, but I am just interested in these things because they are interested in what concerns me. As the eggs were being laid, at the end of her tail I saw two little fingers, or two little palpi, that were pulling the hairs from the tail and putting them on to the eggs as she deposited them. From the middle of that little roll I took with some very fine forceps some of the hairs—and I rubbed them on to my wrist, and I can show any of you what they did. Before I rubbed them on to my wrist I examined them with a microscope and photographed them, and they were very finely barbed, as you will see in this picture.

These photographs are all magnified one hundred diameters. The one on the upper left hand side shows some of the long hairs of the brown tail caterpillar. The one on the upper right side shows the hairs from the tail of the brown tail moth, taken from the little roll of spun eggs and hairs that I have already passed around. Please be careful of those hairs. I have put a glass over them, because I don't want any of them to get out and give you the itch, as they may if they get on to your skin. The photo in the centre is a picture of human hairs, magnified one hundred diameters, and here below are the hairs of the gypsy caterpillar, and here the hairs of the gypsy moth.

I don't know that it is anything new to you, but last winter, in looking over some of the winter nests of the brown tail moth and picking out the little caterpillars, which at that time of the year are only about one-eighth of an inch long, nearly every time I handled these nests I got the rash on my wrists and on my neck.

I would like to ask Mr. Kirkland what is the present state of the section of country where the gypsy moth first made its appearance, and also the country where the brown tail moth was first discovered. If I have been informed correctly, the first brown tail moths came into an orchard near the Somerville station on the Fitchburg railroad. I remember going by on the trains and seeing that the foliage had been stripped from the pear trees, and afterwards seeing the nests in the tops of the trees. But the other day I noticed that that orchard looked splendidly, and it did not seem that any measures had been taken to protect the treees; they had not been sprayed that I could see, and no tree tanglefoot had been put round them to prevent the caterpillars from crawling up. I have been wondering if the moths have gotten out of that locality, and of the locality in Medford where the gypsies first came, or are they still in both of those localities?

Mr. Kirkland: In answering Professor Underwood's question, I would say that the brown tail was first brought to Somerville, and that original locality has been very thoroughly worked; in fact, the whole city of Somerville has been thoroughly worked every year for four or five years. The city, through its street department, has made a business every winter of cleaning up the brown tail on private property, as well as on the street trees. There are very few brown tail moths this year anywhere in Somerville, for the reason of the good work done last winter. The gypsy moth was brought to Medford in the Glenwood or Park street section, and I am told, or was told in 1894, that the old trees, the old growth, there was practically all killed off. There are but very few old trees there. Now that section has been cut into house lots and built up so thoroughly that, while there are gypsy moths there, they are not worse than you would find in any thickly settled residential section in Malden, or Melrose, or Arlington.

I may have given the wrong impression. I spoke about the poisoning of the brown tail moth. I am glad that Professor Underwood has brought it out so well. Of course, I must admit, first of all, that we don't know all that is worth knowing about that particular question, and I wish some good physician or some good chemist would take it up and work it over thoroughly and go to the bottom of it. It has not been thoroughly worked out yet. There is a gentleman connected with the Harvard Medical School who is now working on that, and I have supplied him with some material. I hope he will get to the bottom of it.

I had occasion to make some microscopic examinations of the hairs of the moth. I examined perhaps a couple of hundred moths, winged moths, all told, and found on all parts of the body of the winged moth, particularly on the female, a whole lot of these barbed caterpillar hairs, but none of those hairs attached in a socket the way the scale hairs are, or the hairs which pertain to the moths. That has been simply my examination of perhaps a couple of hundred specimens, and it may be that those hairs grow on their bodies. I do know this, though, from experiments similar to what Professor Underwood has made, that I can poison myself very nicely by rubbing a female moth on my wrist. I did that at the suggestion of Dr. Hill. The male moths don't seem to poison as badly. I inferred—this was simply a matter of inference—that the female in coming out of the cocoon, which is fairly tight, has that big tail to drag through the small opening, and she has to do more struggling than the male moth does, and she consequently breaks off more cocoon hairs. Now, I have collected and handled perhaps a thousand winged brown tail moths every year with impunity. I have never had any poisoning, except when I took pains to rub one into my wrist. On the other hand, the caterpillars and the cocoons poison me very badly; indeed, I get worse poisoning from them than from the moths.

Those are merely observations bearing on the general subject. There is need enough of some one to take up the matter and go to the bottom of it. If any of you gentlemen have the time or disposition, I would be very glad to see it done and to give you a whole lot of good material to work with.

THE VICE-PRESIDENT: Are there any further questions to be asked? This is your opportunity, having Professor Kirkland before you, brim full of the information which you want.

DR. A. L. SHIRLEY: I would like to ask the Professor, Mr. Chairman, if there has been any better remedy than bicarbonate of soda discovered for the poison of the brown tail.

MR. KIRKLAND: Mr. Chairman, there are about 1400 different remedies, and they all work well with individuals. A great many people have used a simple thing like glycerine or vaseline, and got relief from it. Others use the coal tar disinfectants, like sulpho napthol, and get relief from them. Bicarbonate of soda seems to work well with Professor Underwood. Two or three people have told me that vinegar worked beautifully with them. Here is an acid as against an alkali. One man in the office said he had great relief from simply applying alcohol externally. He thought he might try it internally the next time to see how it worked. There are a whole lot of remedies, and I should not dare to prescribe. I imagine any cooling application will give a certain measure of relief.

I might say, with your indulgence, Mr. Chairman, that at our office at No. 6 Beacon street, Boston, we have plenty of reading matter on these two insects, copies of the new law, and we should be very glad to see any of you there and to give you any information or help in our power.

PROF. THEOBALD SMITH: Mr. Chairman, it seems to me that the effect of the hairs is like that of a poison. When Mr. Underwood rubbed his wrist and mine a few moments ago there appeared on his wrist, after perhaps two minutes, perhaps less, a wheal, which was very much like a bedbug bite, or possibly a mosquito bite. It seems to me that it would be impossible for a set of barbs to cause that amount of disturbance within that short period of time. We know that when we are pricked by thorns in the garden the pain does not begin for some time, until they are forced deeper into the true skin, and then the pain continues until they slowly are pushed out by the forming epidermis. It seems to me quite impossible to believe that we have here simply mechanical irritation to deal with. It seems as if we had some poison, something like that which is secreted by the mosquito when it stings, by the bedbug, or by ticks. In my case there was no effect produced, and I do not see why it should not have acted upon me just as it did upon Mr. Underwood, if there had not been a poison involved which selects individuals and demonstrates that there is an increased susceptibility on the part of some to this substance.

I would like to ask Mr. Kirkland why the gypsy moth does not produce similar disturbances, since these barbed hairs are present in the hairs that cover the eggs? I examined this morning very carefully under an oil immersion lens a felted mass of hair from the egg mass of a gypsy moth picked up in Somerville two days ago. There were among the more delicate hairs larger barbed hairs, with saw teeth. Why should not the gypsy moth also poison individuals, if it is simply the mechanical attachment of these hairs to the skin?

Mr. Kirkland: I am afraid, Mr. Chairman, that I cannot answer that satisfactorily, for I presume there is a variation in these caterpillar hairs, that is, that the brown tail moth hair is much more brittle, as it certainly is finer, than that of the gypsy moth. The most notable case of poisoning from caterpillar hairs is that of the European processionary caterpillar, an insect which has much longer hair than either the gypsy or the brown tail moth. That fellow is so poisonous that cattle cannot browse in badly infested pastures. Ratzeburg, the old German entomologist, in one of his books, said that he never had been able to make any investigation of the feeding habits of that caterpillar, because of the terrible poisoning which he received. In regard to whether it is a mechanical poisoning, or a toxine, or anything of that sort, I have simply stated the facts. We don't know. There is no proof that has now been developed, by chemical analysis, that there is any active principle there, but that is not saying that it is not there. The natural thought is that it would be, perhaps, an organic acid, or something of that nature, as in the case of the sting of a bee or the bite of an ant, but this was not found by very careful chemical analysis. This gentleman at the Harvard Medical School, whose name has slipped from my mind, is working on the problem now, working very carefully, and making solutions, trying to produce this poisoning from some solution or culture which he hopes to obtain. I expect another year we shall know a great deal more about it than we do now. I simply stated the facts that I had at hand.

THE VICE-PRESIDENT: I would lke to say that Professor Fernald from the Agricultural College was expected to be here this afternoon and talk to us concerning this part of the subject, the barbed hair and the possible poison which seems to come from the hair in some way. If it is possible for me to secure from Professor Fernald a short paper concerning what he would have said to us, for publication in the next issue, I will do so.

DR. PERRY: I would like to ask Mr. Kirkland if there is any immunity after a person has been poisoned, whether he is just as liable to be poisoned again. I had a very severe case of brown tail poisoning, that lasted for three weeks, and since then, although I have been exposed several times, I have not been poisoned at all.

MR. KIRKLAND: Mr. Chairman, all I can say is that every time I handle the cocoon or the caterpillars of the brown tail I get badly poisoned. I don't know whether a person can become immune or not; I should rather doubt it.

I might say just one word about the way this poisoning has spread. It has spread through poor laundry arrangements, where people hang out the washing under trees badly infested by the brown tail moth. The stockings and flannels and other garments are hung up and are infected by the blowing hairs. A case was brought to my attention in Somerville, where a man who was working in some hot place wore a heavy flannel undershirt to absorb the perspiration. His shirt was hung under an infested pear tree that was literally swarming with brown tails. His wife ironed it carefully, turned it right side out and ironed it again. He put that shirt on, and had a good case of rash from his hips to his neck. This is a very serious thing, indeed. I have known of a small laundry that dried clothing under some infested trees, and the patrons of that laundry were very badly poisoned by certain articles in their washing.

Dr. Miller: Mr. President, I would like to ask Professor Kirkland two questions. In the first place, he told us that he had agents collecting the parasite which was supposed to destroy the moths. Will the same parasite destroy the brown tail and gypsy moth, or does it require a different parasite, and also has he had a chance to test this in this country, to see whether these parasites will destroy the moths, or is that only theoretical?

Mr. Kirkland: Mr. President, all I can say is that several of the common enemies of the brown tail moth in Europe are also enemies of the gypsy moth. There are also some which breed in winter nests of the brown tail, which do not attack the gypsy moth. As far as getting results in this country goes, we have simply received within two or three weeks our first shipments. They are coming in about every day now. I can't say anything further, except that the parasites will be reared. They are coming in a dormant state, pupæ, as we call them. As fast as these flies emerge they will be put with caterpillars, and I can see no good reason why they won't attack them. But in the meantime, as Dr. Smith has so well put it, we must keep hammering away with the means we know to be effective. We must paraphrase the old hymn, and watch, and fight, and spray.

Dr. Davenport: I should like to ask the Professor as to the possibility of the parasites themselves becoming nuisances, whether the remedy may not be, perchance, worse than the disease. Then, in regard to the poisoning by the brown tail, I find that there is a great difference of susceptibility. I happen to be one of the unfortunate ones. Even during the early spring—this spring I trimmed my trees before the leaves came out—to go under any of my trees and stay five minutes and disturb trees or leaves in any way will give me itching for a week.

Mr. Kirkland: There probably were some cocoons, or skins, or something of that sort, some refuse of the brown tail of the previous year, in your trees, and of course you naturally got poisoned by them. Now, as to the remedy being worse than the disease. The parasites are quite closely restricted to their hosts. They are adapted to breeding on these caterpillars, and some of them probably won't breed on other caterpillars. But none of the parasites which we shall bring over will attack foliage; they are all insectivorous. There will be no more danger of their attacking a staple crop or a shade tree than of a potato bug's eating up a fur coat. They are limited by nature to certain kinds of food, and they will feed on those kinds of food alone. When the food supply gives out, they will probably diminish in number until the food supply again increases. Of course, this parasite experiment, which is costing us a lot of money, may be a complete failure; we simply have not turned that stone over yet, and now we have got our levers under it and are going to turn it over and see what is beneath it.

Dr. Hibbert W. Hill: I have had the pleasure of staying in a gypsy or brown tail locality for a short time with my family, and we thought that we observed that there was likely to be an eruption of the rash during warm, dry weather, and that the eruption would be suspended if there was a heavy downfall of rain. I, not knowing much about it, supposed that was simply because it wet down the hairs and they did not blow about so much. I should like to ask Professor Kirkland if that observation has been made, and also another thing with regard to lesions other than skin lesions. My three youngsters had very severe irritation of the eyes for some days after they first went to that district and some laryngitis. I do not see why, with these hairs blowing about in the air, they should not produce sore throat and eye lesions, as well as the ordinary skin lesions; but one seldom hears anything but the skin lesions described.

PROF. KIRKLAND: It seems quite possible that rains would wet down the hairs and prevent them from blowing about. There have been reported to my office about a dozen cases of disease or inflammation of the eye, caused by these brown tail moth hairs. I presume there have been many more that have not been reported. Dr. Loring, an oculist in Boston, is working up that whole subject. I have reported every case to him, so that he might make an investigation. There was a case which seemed to be pretty well authenticated last year of a person in Lynn, who was unfortunate enough to eat some currants, or cherries, or something of the sort, with brown tail moth hairs on them, and this person had a very unfortunate experience. The doctor that told me—I got this from a doctor, I don't know the facts—was in Lynn when I spoke there last winter, and he described this case to the audience and said the person was still quite sick and under his care. The whole thing dated back to getting mixed up with the brown tail moth and eating some of the hairs. Now, that is simply given to you as a statement made to me.

THE VICE-PRESIDENT: Knowing that we might in the course of the discussion this afternoon run across some legal question that ought to be elucidated, I invited the Assistant City Solicitor of Boston to be present. I call upon Mr. Child.

MR. SAMUEL M. CHILD: Mr. Chairman and Gentlemen of the Association, I don't know why I should be expected to know anything about the moth question. My job is to enforce the orders of the Board of Health, if the people don't obey them, after the Board has passed those orders. The only pest that I have had experience with this summer, having moved out to the country last fall, was woodchucks. I suppose I am the only living man that has shot woodchucks within the city limits. About the brown tail moth and the gypsy moth I know absolutely nothing, because they have not got out into my region, as far as I know. But it has occurred to me in the discussion here that if these bugs are flying around so promiscuously in the summer, and are round the lights as much as they are described as being, that might be a good way to exterminate them. I was coming down town one morning and saw a man cleaning out an electric globe on an incandescent light, and he turned about a quart of insects out of the globe. That indicates that these bugs are flying around a bright light. If that is so, why won't a gasoline torch put out in the early evening, with a bright light, kill thousands of these bugs, and moths, or anything else that flies round? It seems to me you might catch a good many of them in that way. Have a light that is exposed, and not one that is in a glass globe. I understand they fly round a light very much. It seems to me if the light was out where they could get in contact with it, it would finish the bugs. I want to make that suggestion.

MR. COFFEY: Mr. Chairman, I have been wondering since this discussion opened whether the experience and the methods employed in Worcester were unique, or whether they were common to other places that have been afflicted. Last winter a visitor to Worcester made known to the residents there the fact that he had discovered several nests of the brown tail moth scattered about on the trees, and immediately the Park Department took the matter in hand and appealed to the School Department. Every principal, in every school district, was asked to announce to his pupils that the Park Department would pay a small sum to the children for a certain number of nests; I think it was a cent or two cents for five or ten nests. That was done throughout the city. They found, to their great surprise, that there were a great many of those nests scattered about the city. Those young urchins, from ten to fourteen or fifteen years of age, all over the city, in every school district, were shinning up trees. I know in my neighborhood there was a gang of about twenty or thirty that shinned every tree that there was in his neighborhood, whether there was a nest on it or not. But they effectually disposed of the moth question. Worcester has not had a single moth, nor a caterpillar, that I know of, since then. They cleaned up the entire city, and I think I saw it announced in the paper that the cost was something like $50 or $60. Some youngsters got 25 or 30 cents out of it, but they worked there for two or three weeks thoroughly. Of course the Park Department had a lot of men at work on the streets, and looked after this, and made a sort of general oversight, went over the ground after the youngsters and picked up a stray nest here and there. But we have not had, to my knowledge, and I have not seen any announcement of that sort, a single nest escape. They thoroughly cleaned up the city last winter, along in the late winter, before the foliage appeared. I have been wondering, as I said at the start, since the discussion opened, whether Worcester was unique in that method of treatment, or whether that was common to other places and they had tried it in other places. It seems to me that it is an efficient way of disposing of the moths in the early stages.

MR. UNDERWOOD: It seems to me that our friends from Worcester and Fitchburg have children in their towns perhaps that are more industrious, more diligent and keener sighted than the children of other places, because in some instances that I have known of this work has not been well done by children. I don't think children are quite competent to do this sort of work. Some of our trees would suffer if we let the children go indiscriminately about them, cutting off the nests, and it is not always certain that they would take all the nests and always destroy them.

Mr. Child has spoken about the brown-tail moths being attracted by light at night, and he suggested the possibility of destroying them by setting up a torch where they could fly into it. I hardly think they would be attracted to any extent by a torch light.

If any of you were out in the evening during the recent moth flight you must have noticed that there were a hundred times as many moths flying about the arc lights than there were around the incandescents.

Very few, if any, of these moths seem to be attracted by the yellow incandescent light, while the intense white light of the arc seems to lure hundreds of them to it.

In Belmont when this year's flight first began our society for the suppression of insect pests had some frames made which were covered with sticky fly paper. The frames were hung over the arc lights. They were made of telegraph wire, about eight feet long and four feet high, and two feet deep and open on one side, that is they allowed the moths to come in towards the light. Cotton cloth was stretched over the wire, and to this cloth on both sides and bottom, sheets of sticky fly paper were pinned each day, fresh sheets of fly paper were put on and the old ones, covered with moths, were burned up.

The first night we caught by actual count 2000 brown-tail moths on one frame. Eventually twenty frames were put in commission, and many thousands of moths were destroyed in Belmont in this way at a comparatively small expense.

Dr. Pilling: Mr. Chairman, I think the method that the gentlemen from Worcester has spoken of has proved very effective in Newburyport. It is a method that has been adopted for the last two years. They have paid the children but the small sum of seven cents per 100. The Tree Warden arranged two days a week, when he would receive these nests from the children, and if you had been out by his house you would have thought that he was surrounded by rag pickers. There were many, many thousands of nests that he got in that way, with a comparatively small expense. If my memory serves me correctly, the first day he received over 80,000 nests from the children in collecting them in this way.

Dr. Holden: I would like to say that I live in Melrose, which is the centre of an infested region, and a badly infested region. Very much of the discussion that we have heard here this afternoon we have heard from various societies and organizations for the last five or six years. Some of these methods are doubtless good, but I doubt very much if they will satisfy the law, which goes into operation this year, or if they will satisfy the superintendent under whose care the work is to be done in the future. The method of collecting by children, the attraction by lights and by various other methods, are possibly good in their way. We had all those methods in Malden, Melrose, Somerville and Medford, and what is the result? The result is that we are worse infested with the gypsy and the brown tail this year than we ever were before. Now the law, which goes into operation this year, is a very explicit one. The work is to be done by the various cities and towns, and it must satisfy the superintendent in charge, and we shall get instruction from his office, probably, or at least the town and city officers in charge of the work will get instruction. My advice to gentlemen from the outskirts, that have not had the experience with the brown tail and the gypsy that we have, would be that they leave the experimenting with somebody else, and simply follow the law and the instructions that they get from headquarters.

Dr. McFee: The gentleman from Worcester has spoken in regard to the method there. I would say that that experiment was tried in Haverhill, that a society of ladies made an offer to the school children of so many cents a hundred for all the nests they would bring in, and it was found that there were very large returns in a short time; the children were getting very industrious. Upon investigation it was found that these children followed up the work which was being done by the street department, that they made collections from the work that it had been doing and brought in nests that had been collected by the Street Department!

Dr. Keliher: I would like to ask Professor Kirkland what benefit he expects to result from spraying the trees; how much help that would be in abating this nuisance.

Mr. Kirkland: The spraying that is done at the right time will practically keep the tree in good foliage for the summer, no matter how badly infested it may be. The spraying is of particular value against the gypsy moth, and of less value against the brown tail moth, because the brown tail begins to feed at the moment the buds open. But spraying, if it is done between the 10th of May and the 15th of June, is very effective. We have now power outfits, gasoline engines with pumps attached, by means of which the street trees, and even tall elms, can be sprayed very cheaply indeed. Some city departments have sprayed average street trees at a cost of not to exceed ten or fifteen cents a tree. This is perhaps the cheapest way to handle the matter. Spraying is one good method. It is a method we can use between the middle of May and the middle of June, and after that it loses its value. It would be of no particular value to spray now for the gypsy moth, because the caterpillars have done feeding. We are going to settle the question whether fall spraying will help with the brown tail moth or not. That is an experiment which will be made this year.

I might say on this topic of having the children do the work that one great advantage is that after a boy has got a certain number of webs his big brother or his father becomes interested, and you get the judgment and the help of the older generation. On the other hand this method is open to the objection that they get the webs that are easiest reached, and neglect those which are more difficult of access. Another objection has come up in the case of one city. I won't mention any names. One city paid a substantial reward per hundred for the webs, and some budding financial genius went out to a neighboring town and organized a small crew of boys. The neighboring town was very badly infested. He collected several barrels of webs, brought them home and got the bounty. Then another objection occurs to a family man. Every now and then some boy, through an excess of zeal, or lack of judgment, or something, will fall out of a tree, and there have been a number of cases where legs or arms have been broken. I think if I had a boy of suitable age for that work I should keep him in the house and let somebody else do the gathering of the webs.

Dr. Stevens: In Professor Underwood's town I think there is a very good illustration of the benefit of spraying trees. He probably knows the Hittinger farm, a large fruit farm in Belmont, where great pains is taken to prevent all insect pests destroying the trees and fruit. I have taken a good deal of pains to examine the trees on that farm, and I have not found one tree yet that is affected by the moth. They have thousands of trees, and they are all green. Just a fence separates their farm from other farms. The other farms are entirely stripped of foliage, and the trees on their farm are as green and perfect as any trees you could see. It seems to me that is a very good illustration of the benefit of spraying. They have sprayed their trees very early for several years, and they have not had any trouble.

The clinical side of this question is rather interesting to a doctor. It was my fortune to see some of the very first cases of gypsy moth poisoning which occurred in this state. People living on Park street, Somerville, came to me the very first season that the gypsy moth appeared, with a peculiar eruption that I failed to recognize. One day a lady came into my office, and I picked a moth off her neck. The first thing I knew I had the same sort of trouble myself. I handled the moth. I was pretty uncomfortable that day. Then I began to make inquiry, and I found that this moth was working on Park street, and that very many of the people on that street were affected. It seemed to me fair to presume that the moth had something to do with it, and we learned very soon that it did. The peculiar eruption which I saw then, and that I have seen other years, was a very different type of eruption than I have seen this year. I never had seen an eruption which seemed like ordinary urticaria until this year. Almost all the cases have had the urticaria in addition to a fine papillary rash. It comes out all over the body. It starts on the neck with this fine rash, and pretty soon they have an eruption all over the body. This seems to me more like some toxic thing than that it is all due to the irritation of the hair from the moth.

Another thing that has occurred to me; this year I have seen quite a number of people who have been very ill from the moth poisoning, so that they have been confined to bed for two weeks. One case was that of a nurse. She had a temperature of 105 and was very ill. She was in bed for two weeks with an eruption more extensive than I had ever seen. She was covered from head to foot. She was in the town of Arlington, in a sanitarium, and all the people living there were very much affected. It is one of the most affected districts in Arlington off of Pleasant street. This woman was greased over and bathed with all sorts of things. She had to be in bed, with a nurse, in fact with two nurses. She got better, and went back to her patient, but came down again with the same thing. She got better again, and on making another visit to the same locality she had a third attack. Then she took to the woods, thought it was no use to go there any more. So in her case certainly there was no immunity.

Now we all know that there are very many people who are perfectly immune from ivy poisoning, or dogwood poisoning, and there are others so susceptible that if they go through the centre of a street where ivy is growing on the wall they get poisoned. A great many people are poisoned by a weed which is called the nettle; I don't know the botanical name. A great many people are very seriously irritated by that. Other people may handle it without the slightest trouble. So that the susceptibility is probably the same from this poisoning as it is from other things, as the Chairman has said.

THE VICE-PRESIDENT: The next quarterly issue of the Journal of this Association will be sent to all boards of health, and will contain the full text of Professor Kirkland's address, and also the discussion, so that each member of the Association and each board of health within the Commonwealth will have at hand such information as we have secured this afternoon for their guidance.

DR. PALMER: I move that the thanks of the Association be extended to Professor Kirkland for his very interesting and instructive address.

DR. MILLER: It gives me great pleasure to second that motion. I am sure we have all been very much interested and benefited. It gives me great pleasure to second the motion.

The Vice President: It is moved and seconded that a vote of thanks of the Association be tendered to Professor Kirkland for his able and interesting address this afternoon.

(The motion was adopted, and, on motion of Mr. Coffey, the meeting adjourned.)

PREVENTIVE THERAPEUTICS.

By Herbert D. Pease,
Director Antitoxin Laboratory, State Department of Health,
Albany, N. Y.

DIPHTHERIA ANTITOXIN IN THE PHARMACOPOEIA

The Eighth Decennial Revision of the Pharmacopoeia of the United States, which has just appeared, contains Diphtheria Antitoxin (*Serum Anti-diphthericum*) as an official remedy. The official description of this remedy given below is based on a report of a special committee appointed for the purpose of drawing up a statement concerning its nature and the estimation of its strength as well as its proper dosage.

"Serum antidiphthericum, antidiphtheric serum, diphtheria antitoxin, a fluid separated from the coagulated blood of a horse *Equus Caballus*—Linne, immunized through the inoculation of diphtheric toxin. It should be kept in sealed glass containers, in a dark place, at a temperature between 4.5 degrees and 15 degrees C. (40 degrees and 59 degrees F.)"

"A yellowish or yellowish-brown, transparent or slightly turbid liquid, odorless or having a slight odor, due to the presence of the antiseptic used as a preservative. Specfiic gravty: 1.025 to 1.040 at 25 degrees C. (77 degrees F.)."

"Antidiphtheric serum gradually loses its power, the loss in one year varying between ten and thirty per cent. Each container should be furnished with a label or statement giving the strength of the Antidiphtheric Serum, expressed in antitoxic units, the name and percentage by volume of the antiseptic used for the preservation of the liquid (if such be used), the date when the Antidiphtheric Serum was last tested, and the date beyond which it will not have the strength indicated on the label or statement."

"The standard of strength, expressed in units of antitoxic power, should be that approved or established by the United States Public Health and Marine Hospital Service."

"Average dose, 3000 units."

"Immunizing dose for well persons, 500 units."

Attention should be called to one or two points in this description. First that the antitoxin gradually loses its power, and that the loss may be as high as 30 per cent in one year. This figure is undoubtedly too large for most antitoxins. Miller (Centralblatt fur Bakteriologie Abt. I, 1905, vol. 38, p. 233) has shown, and the writer's experience confirms his statement, that the large majority of antitoxins lose but little of their specific strength in one year, and that a large number have lost but little during two years. It is important to realize that diptheria antitoxin does not deteriorate in any other way than this gradual loss of strength. It is claimed by Escherich and others that the older antitoxins are less likely to cause the serum urticarias and other skin disturbances, than those recently obtained from the horse. It can be safely concluded that an antitoxin last tested a year ago, and which has been properly kept in a cool, dark place, will contain the strength which it contained when it was issued. The second noteworthy point is the standard of strength of the antitoxic unit. The standard adopted by the U. S. Public Health and Marine Hospital Service is one based on Ehrlich's normal serum.*

Bottles of the standard unit serum are now regularly distributed to the licensed manufacturers in this country at stated periods, and these are utilized for the standardization of diphtheria toxins used to test the strength of antitoxins. All manufacturers have access, therefore, to the same standard for testing their antitoxins.

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*Rosenau, Bulletin, Hyg. Lab., U. S. Pub. Health and Marine Hosp. Service, No. 21, April, 1905.

The third important point is the dosage. It should be noted that 3000 units is stated to be the average dose. Much larger doses may be and certainly should be used in severe cases, and should be repeated until convalescence is definitely established.

THE TREATMENT OF SCARLET FEVER WITH ANTISTREPTOCOCCIC SERUM—In view of the reports of Escherich, of Moser and others, of the very favorable results obtained by them in the treatment of scarlet fever with antistrepto coccic serum, prepared by Paltauf according to Moser's ideas, it is of interest to consider the reports of others who have used this and other antistreptococcic sera in similar cases.

Mendelsohn[†] administered Aronson's serum in 165 cases and Moser's in four cases of scarlet fever. In some of the former cases the serum was injected directly into the tonsils, and the author seems to think well of that method of administration.

He considers the effect of the serum injections under two heads, first, the influences upon the cause of the disease in its acute form, and second, the effect upon the complications.

The author states that he failed to note any essential alteration in the course of the true scarlet fever symptoms which were due to the serum injections. In his further elaboration of this point he claims that the temperature courses in this disease are of two types, one in which the fall is rapid and the second shows a prolonged gradual decline. In 126 of the first 165 cases these two types of temperature curves were uninfluenced to any marked extent by the serum injections. He furthermore calls particular attention to the similarity between the first or rapid type of temperature decline, to those temperature curves shown by Moser and Escherich, who attributed the rapid decline to the injections of the Moser serum.

Concerning the influence of the injections upon the usual complications, the author states that they were apparently without any marked preventive influence. He claims that if the character of a given epidemic concerning the frequency of these complications, is taken into consideration, the power of the serum to prevent them is not strongly manifest.

[†] Deutche Medicinische Wochenschrift, 1905, vol. xxxi, p. 461.

Eighteen of the 165 cases ended fatally, and the majority received large doses early in the course of the disease, which was of a malignant or septic type.

Of the four severe cases treated with Moser's serum only one was apparently benefited, and in none was the course of the fever definitely influenced.

Gaughofner* used Aronson's serum in fifteen cases of scarlet fever, all but two of which were of a very severe type. Seven terminated fatally.

While a fall in temperature folowed the administration of the serum in some cases, the fall was usually followed by another increase. The author doubts the influence of the serum in such exacerbations. The Moser serum was used in eight very severe cases of scarlet fever, and five died, one within twelve hours of the injection. Only two were injected on the first and second days of the disease, and both of these patients recovered. The course of the disease in the other cases was not definitely altered nor were complications prevented by the serum.

The author states that he observed no such sudden falls in temperature after the injections as have been described by Moser, Escherich and others. He concludes that he cannot definitely say from these small series of cases that either serum has a definitely beneficial influence on the scarlet fever processes.

Quest† reports the treatment of twenty-one cases of scarlet fever, in which eleven were given antistreptococcic serum prepared by Bujwid, and the other ten that of Moser. The former serum is prepared according to the Aronson method. Of the former eleven cases two died. The course of the temperature was affected in but two instances and markedly in only one. Of the second ten cases three died, two soon after injection, and the third had tuberculosis as a complication. The temperature dropped within twenty-four hours after the injection of two patients, but rose again on the fourth day later. But few of the patients experienced a general betterment of their condition.

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*Deutsche Medicinische Wochenschrift, 1905, vol. xxxi, pp. 529, 592.

†Deutsche Medicinische Wochenschrift, vol. xxxi, p. 988.

The skin disturbances of the disease were never prevented, but in some cases were intensified.

There was no difference in the course of the disease in three sisters, one of whom received the Bujwid, another the Moser and the other no serum whatever.

In only one case were the sequelae apparently prevented or influenced.

The author considers the series too small to warrant definite conclusions, but he does not consider the advantageous working of the serum to have been demonstrated.

ANTIPNEUMOCOCCIC SERUM IN PNEUMONIA.—Knaugh* administered the Romer antipneumococcic serum in seven cases of croupous pneumonia in the Royal Garrison Hospital at Wurzburg. Romer serum is a mixture of the sera of horses, cattle and sheep, which have been actively immunized with many cultures of pneumococci isolated from infections in man.

The doses used were 20 c. c. and were repeated one or more times.

The author states that there were no unfavorable or harmful effects noted which were due to the injections.

The pulse, temperature, respiration and general condition were all favorably influenced by the treatment. A rapid, decided fall in temperature was observed in but one case in which the serum was given early in the course of the disease. In the others the temperature fell gradually. Convalescence pursued a normal course in all the cases.

A CURATIVE SERUM FOR TYPHOID FEVER.—Stokes and Fulton† have recently made a most complete and detailed report of their work begun several years ago on the production of an antityphoid serum.

Progressive doses of living virulent typhoid bacilli were injected subcutaneously into four hogs. In three single strains of bacilli and in the fourth different cultures were employed at different times, thus producing a so-called polyvalent serum.

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*Deutsche Medicinische Wochenschrift, 1905, vol. xxxi, p. 452.

†Journal American Medical Association, 1905, vol. xliv, p. 1504.

The serums obtained from these hogs were tested for their protective value on guinea pigs, which were subsequently given definite and certainly fatal doses of either dead or living typhoid bacilli. The agglutinating and bactericidal power of these serums were also tested.

In the tests of the serums' protective power the results showed that from 1-600 to 1-800 of the guinea pigs body weight of serum would protect them, when injected subcutaneously, from four times the certainty fatal intraperitoneal dose of the typhoid bacillus. The serums also showed marked agglutinating and bactericidal powers.

These serums were administered to twenty-three patients having typhoid fever. Two of the series died, of which one was from secondary streptococcus septicaemia.

In fifteen of the cases the favorable result was contributed to by the use of the serum injections. The authors conclude that they believe "that by the use of this serum the febrile period may be shortened and the daily variation may be favorably modified."

MUNICIPAL SANITATION.

By Charles .V Chapin, M. D., Superintendent of Health, Providence, R. I.

SPIT SIGNS.—In Providence there have recently been placed, at frequent intervals on the principal streets, signs bearing the following inscription: "Do Not Spit on the Sidewalk. Fine Twenty Dollars."

These are enamelled signs, with blue letters on a white ground. They were made by the Baltimore Enamel & Novelty Co., and signs 8x10, lettered on one side, cost $23 per hundred. The cost of putting up the signs was nearly as great as the signs. These signs seemed to meet with popular approval, and there was considerable demand for them even in the poorer sections of the city.

Since the signs were put up, some six weeks ago, there has been a great falling off in the spitting habit, and there is now very little spitting upon the sidewalk.

SMALLPOX IN LEICESTER, ENG., IN 1904*—Leicester is a city of nearly 200,000 inhabitants, a large proportion of whom are opposed to vaccination, and are as a consequence unprotected. An outbreak of smallpox began in December, 1902, and continued practically without interruption until August, 1904. In all there were 715 cases with 21 deaths. It is interesting to note that in an unvaccinated city and with very little public vaccination (only 5488 public vaccinations were performed in 1903 and 1904) the outbreak assumed no more alarming proportions than in many other cities of England and the United States where public vaccination is vigorously prosecuted. But there is no warrant for taking this history as a vindication of the "Leicester method" of fighting smallpox, i. e., by isolation alone. While outbreaks may be stamped out by this method, better results will in the long run be obtained if vaccination can be pretty generally performed. While the population of Leicester are antivaccinationists, their efficient and progressive health officer is a thorough believer in the efficacy of vaccination as a preventive of smallpox. But he recognizes that even an approximately efficient vaccination of his city is impossible, and he wisely calls attention to the futility of the vaccination of chldren alone as a means of rendering a community immune.

Many of the observations in this report are merely in accord with universal experience in smallpox and vaccination, but a few are novel or of especial interest. Thus the value of vaccinating contacts is shown statistically. Of 707 inmates of houses where there was smallpox, 533 submitted to vaccination, out of these 4.8 per cent were attacked; 174 refused vaccination, and of these 20.6 per cent were attacked.

It is refreshing to find Dr. Millard questoning the effect which vaccination has had in the diminuton of smallpox mortality. That it is due largely to vaccination is doubtless true, but that more efficent isolation and decreased fatality have played an important part is perhaps equally true. That the inherited effects of vaccination, either upon the human or the smallpox organisms have mitigated the severity of the disease there is not the slightest evidence.

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*Report on Small-pox Epidemic, Leicester, 1904. C. Killick Millard, M. D.

The importance of unrecognized cases in causing smallpox, and indeed all contagious diseases, is now generally acknowledged, and data illustrating this are given in the report. Thus five of these cases gave rise in four weeks to a nest of forty. In houses where the initial case is recognized 8.3 per cent of the contacts are attacked, but when the initial case is not recognized 63.6 per cent are attacked.

Tramps are considered an important factor in the dissemination of smallpox in England as in this country, and Dr. Millard suggests that applicants for municipal lodging should be required to show a certificate of revaccination or be vaccinated. This may be feasible in England, but the impossibility of securing uniform legislation in all our States would interfere with its success here. There is considerable variation in England as in the United States, in the mode of treating contacts. Sometimes they are strictly isolated and sometimes they are allowed to go at large or attend to their business, subject, however, to daily inspection. In Leicester they are not allowed to work, but receive some compensation from the city. In the epidemic in question the total amount so expended was £372. It is claimed that under this plan they are much more obedient to rules, less likely to conceal themselves, or remove from the city.

ACUTE INFECTIOUS DISEASES.—Under this title* William M. Welch and Jay F. Schamberg have recently published a volume of great practical value to all sanitary officers who have anything to do with contagious diseases. The work is restricted to the more common and directly contagious diseases, as the authors explain, to those with which they have had large personal experience. This experience is indeed large, for the authors state that there have come under their personal observation 9000 cases of smallpox, 9000 of scarlet fever and 10,000 of diphtheria. Such a wealth of clinical material ought to furnish much that is novel and instructive, and the reader is not disappointed. The diseases treated of are vaccinia, smallpox, chickenpox, scarlet fever, measles, German measles, typhoid fever and diphtheria. The etiology, pathology, symptomatology, diagnosis and treatment are all very fully considered, but the strongest and most voluminous part of the work is that relating to symptomatology and diagnosis. A description of typical cases of these diseases is to be found in all text books, but none that the reviewer knows of, not even monographs, deal so exhaustively, and yet with such discrimination, with typical features, which after all are really very common, and are daily brought to the notice of health officials. Thus to take an instance at random, the slighter and more evanescent but yet common types of scarlet fever eruptions are very fully discussed and the points of resemblance to and difference from other rashes carefully described. The desquamation of scarlet fever is described with equal care, and is given its proper diagnostic value. Attention is called, as it rarely is in text books, to the peculiarly characteristic desquamation of the finger tips. The authors warn against the very deceiving character of the desquamation seen in other affections. There are a large number of photographic illustrations, most of which are excellent, and are of great assistance to the reader. There is little to criticise in the work, though the part relating to preventive measures is hardly up to the rest, and the index is not as good as such a valuable work deserves. It is certainly a book which no health officer can afford to be without.

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*Acute Infectious Diseases, Lee Bros. & Co., 1905; p. 765. $5.

SANITARY ENGINEERING.

By Robert Spurr Weston, Assoc. M. Am. Soc. C. E.

ACTION OF COLLOIDAL SOLUTIONS OF COPPER UPON B. TYPHOSUS.*—It has been demonstrated that when water containing typhoid bacilli was allowed to stand in a copper vessel the typhoid fever bacteria perished within one hour. In vessels made of other materials the bacteria persisted at least for three, and in vessels of some kinds for more than twenty-four hours.

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*A. H. Stuart, Am. J. Med. Sci., 129, 760–769. Reviewed by F. P. Underhill, Review of Am. Chem. Research, p. 419–420.

"Raw tap water in glass vessels showed an increase in the number of organisms in three hours. Raw tap-water in copper vessels in one experiment showed a diminution from 384,000 germs per cubic centimeter to 18,000 per cubic centimeter in three hours. Raw tap water containing large numbers of river organisms and considerable vegetable matter, when inoculated with millions of typhoid organisms and placed in a copper vessel, showed that the typhoid bacilli were killed in one and three-fourths to two and one-half hours. Water containing colloidal copper has a more rapid toxic effect upon typhoid than upon river water organisms. The quantity of colloidal copper given off from a one liter copper vessel in three hours was one part in four million. This amount killed off the added typhoid organisms in from one and three-fourths hours to two and one-half hours, and clinical experience has shown that this amount of colloidal copper is harmless when taken into the human system."

COPPER AS AN ALGICIDE AND DISINFECTANT IN WATER SUPPLIES.*—This bulletin is the second one published by the authors, and gives an account of the experiments and practical results which have been obtained since the publication of the first well-known bulletin (reviewed in this Journal.)

During the summer of 1904 over 50 reservoirs were treated for the purpose of eradicating algae, and the results show that much greater dilutions of copper suffice than was thought to be the case when the first reports were published. For example, it has been found that dilutions as great as 1 in 25,000,000 suffice to destroy Spirogyra, and that Uroglena is destroyed in dilutions of 1 in 20,000,000. A table is published by the authors, who recommend that the amounts of copper given in the table for the destruction of different organisms be increased by 2.5 per cent for each degree below or above 15 degrees C., and to high alkalinity due to carbonates.

Experiments were made to ascertain the effect of copper upon fishes of certain species. These experiments showed that some extent for waters containing organic matter and having trout for example are injured by dilutions of 1 to 7,000,000, while black bass will stand dilutions as strong as 1 to 500,000.

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*George T. Moore and Karl T. Kellerman, U.S. Dept. of Agriculture, Bureau of Plant Industry, Bulletin No. 76. Reviewed by L. P. Kinnicut in Review of Am. Chem. Research, p. 353.

A large part of the report is taken up with a discussion of the action of copper sulphate and metallic copper on the typhoid bacillus. The report of Dr. Kendricks Smith, giving an account of the successful application of copper sulphate to the city water of Columbus, O., in removing B. coli, and the lowering of the typhoid fever death rate, and the report by Mr. John Weinzert of Albuquerque, N. M., of an epidemic, which was repulsed probably by the use of copper sulphate, form part of the bulletin.

An account is also given of the experiments made in connection with the rapid water filter plant at Anderson, Ind. These latter experiments showed that when copper was used in conjunction with the sulphate of alumina, used as a coagulant, the B. coli was practically absent. Where the usual coagulants were employed it was generally present in each cubic centimeter of the filtered water.

The authors unqualifiedly recommend copper sulphate as an effective and practical means of sterilizing water polluted with certain pathogenic bacteria, and as an emergency method they say that it is applicable to both household and municipal conditions. They cite many authorities to show that the amounts of copper used are harmless. They hold that it is a natural constituent of the body, and in minute quantities has no effect upon the human organism.

The matter contained in this bulletin is of supreme interest, and the authors are to be congratulated on placing in the hands of sanitarians and engineers a tool which undoubtedly will prove most useful in certain emergencies, and where it is guided by competent hands.

FRENCH TYPHOID STATISTICS.*—The average typhoid fever death rate decreased from 26.4 per 100,000 in 1886 to 20.14 in 1903, due to progress in public hygiene. Cities with improved water supplies and sewerage show greatest diminution. Death rate still too high; should not exceed 16 or 17 in any European city.

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*Dr. Imbeau, City Engineer of Nancy. Eng. News, 54, 1905, 62.

IMPROVED WATER SUPPLY FOR SPRINGFIELD, MASS.—Mr. Allen Hazen, M. Am. Soc. C. E., in a recent report recommends that the future supply of the city be developed on the Little River. His plan embraces a 6,000,000,000 gallon reservoir, conduits, filtration plant, supply mains and a 30,000,000 gallon distributing reservoir. The yield of the system would be 15,000,000 gallons daily at present, 30,000,000 gallons in the future. The construction for the lesser supply would be $2,177,000, including $350,000 for filters.

VITAL STATISTICS.

By John S. Fulton, M. D.,
Secretary Maryland State Board of Health, Baltimore, Md.

Chicago statistics, under the new commissioner of health, promise to be irritating, rather than amusing as they formerly were. They will be no more instructive. The score card has always been more interesting than the game in Chicago. I have now and then aimed a little ridicule at the Windy City's flatulent statistics, and others have done likewise, but without disturbing in the least the hurrah boys of Chicago. The Bulletin of July 8th contains some numerical illusions by the new commissioner. He says that the death rate of New York for the half year (19.40 per 1000) is 37.6 per cent higher than that of Chicago (14.09 per 1000). It would have been just as easy, just as unfair, and much less impressive, to have said that the death rate of Chicago is 27.4 per cent. less than that of New York. For many years the Health Department of Chicago has used this stock illusion, exploiting the vagaries of percentage, and always printing the larger of the two unmeaning statements possible to this mode of statement.

The new commissioner offers a novelty in his suggestion that the population of New York is "estimated," while "Chicago's is *fixed* by the U. S. Census Bureau." Here is an amateur for you, letting fly a missile through his own glazing. If Chicago methods had been employed in the recent census of New York the population figures of New York would have been better "fixed" than those of Chicago. If Chicago had been content with modest inflation of her population count, the row in which the Census Bureau proved a winner, might never have occurred, and so the city might have avoided the painful necessity which she has since made over into a virtue.

Another bad fling of the new commissioner is aimed at the two cities which have done better than Chicago in the matter of smallpox during the last six months. Chicago has had 52 deaths from smallpox in that time, and New York has had 8. Expressed Chicago-wise, New York's advantage is 550 per cent, though the commissioner does not make a percentage statement of this comparison. He says instead: "Every case of this disease (smallpox) occurring in Chicago is diagnosed by experts, and is reported as smallpox if it proves to be so, and not as 'chickenpox,' 'Cuban itch,' etc." The city which excels New York is not named. Perhaps it is a certain coast city which has had no smallpox at all for a year. Such a city would be a fairer mark than New York for insinuations about diagnosis. The large city having a perfectly clean smallpox sheet; though well known to me, is not mentioned, because, for all I know, there may be another large city as fortunate. However well Chicago may rank in the past six months, her smallpox record for six years is not so good as that of Boston, New York, Philadelphia, Buffalo, Baltimore or Washington. The history of the past several years shows few and short intervals when smallpox has been absent from Chicago, and the record as a whole, though creditable to the wretchedly financed health department, is disgraceful to Chicago.

The old plan of analyzing Chicago's special mortality figures, and displaying them against the corresponding data for New

York, is continued by the new health commissioner. For instance, the infant mortality of the two cities, figured on a population basis, gives Chicago an apparent superiority in the ratio of 60 to 43—a superority of 39 per cent by Chicago arithmetic. The same figures show that Chicago has 30.88 per cent of her total mortality under 5 years, and New York 30.97 per cent in that period, so that New York need not feel humiliated by Chicago's apparent superiority in the matter of infant mortality. It cannot possibly be as large as 39 per cent, and may be as small as 3-10 of 1 per cent.

The consumption figures, as published, seem disadvantageous to New York in the ratio of 23 to 17, but on percentage of total mortality the advantage lies the other way: 11.8 per cent. of the total mortality in New York, and 12.21 per cent. in Chicago being due to consumption.

The printed pneumonia figures show a less mortality rate in Chicago (23.65 per 10,000) than in New York (30.78 per 10,000), or 30 per cent superiority for Chicago. Both cities have printed much nonsense about pneumonia, but the score is still in doubt, for the same figures which, applied to the population, give Chicago an apparent advantage of 30 per cent., when applied to the total mortality, show that Chicago attributes 16.9 per cent of her deaths to pneumonia, while New York charges only 15.8 per cent. to this statistical man of straw. The inversion of Chicago claims by the simple means of stating them on a total mortality basis, might be explained on the ground that fewer causes produce the mortality of Chicago. That indeed is true, for New York recognizes 179 causes of death among her population, while Chicago recognizes only 178. This single cause of death, slightly effective in New York, wholly inoperative in Chicago, cannot fully explain the curious results obtainable from the mortality data of Chicago, and one naturally looks to Chicago to solve her own conundrums.

A statistical illusion of a sort too crude to be attempted in Boston, let us say, but good enough to be tried at moderate intervals in Chicago, is found in the Bulletin for July 22. Speaking to the verse from Genesis concerning the duration of man's earthly life, "his days shall be a hundred and twenty years," he says: "And here in this good city of Chicago— despite its crudeness and present limitations—this promise of the Lord is being more nearly fulfilled than in any other of the cities of the earth. In the year 1873, when Dr. Reilly's anticipation was published, there died 9557 out of the 360,000 inhabitants of Chicago—a ratio of 276 in every 10,000. In 1904—thirty-one years later—the ratio of deaths was only 136 in every 10,000. In 1873 the aggregate ages of those who died summed up 146,222.1 years; the average age at death in 1873 was, therefore, 15 years and 4 months. The aggregate of the ages of the 26,311 who died last year was 855,167.5 years, and the average age at death was therefore 32 years and 6 months. In a single generation the death rate of Chicago has been reduced one-half, the duration of life within its boundaries has increased two-fold."

A comparison of the average age at death in 1873 with the average age at death in 1904 furnishes no evidence whatever of increase, or even of alteration, in the average duration of life in Chicago during the past thirty years. A rise in the average age at death between 1873 and 1904 has no significance at all as to the progress of hygiene in the interval. The figures mean something to the advantage of Chicago, to be sure, for they certainly do indicate that the average citizen of Chicago is taller in 1905 than he was in 1873, and has proportionately larger feet. His intelligence, however, has not kept pace with his physical development, if the figures offered by his health commissioner mislead him into believing that the average duration of human life has doubled in Chicago during the last thirty years. To point out the fallacy in this argument from the average age at death is a kindergarten task, and not to be done in these pages. The same atrocious nonsense has been published before in the Bulletin of the Chicago Health Department, without exciting merriment, and its repetition justifies a suspicion that Chicago has no specific levity for figures.

It is pleasant to turn from the vagaries of a long established registration office to consider the first efforts of a new one. The report of the State Board of Health of Florida is just out. The awakening of the South to the fundamental importance of vital statistics is most gratifying. Florida presents in her sixteenth report the first serious attempt to register marriages, births and deaths. The legislature has not been asked to pass a law on the subject, for the State Board of Health has the authority to make its own regulations. The recommendations of the committee of the American Public Health Association, published in Census Bulletin, No. 21, have been followed, and good results should be obtained, if it is possible to register vital statistics without the aid of a statute.

Without a State law, and under regulations of the Board of Health, Florida has registered in the first year (1904) 3898 deaths and 7154 births, giving rates of 7.42 deaths and 14.1 births per 1000 population. The registrar recognizes and proclaims the incompleteness of these results. In a population of little over half a million, mostly rural, the results promise well. The results for the State are at least consistent, indicating about equal shortage in the registration of births and deaths. In some counties the returns must have been nearly complete. Monroe County, having a population of 18,000, shows a birth rate of 41.2 and a death rate of 26.3 per 1000. This is a perfectly consistent exhibit, and doubtless represents the best local registration done in the first year of Florida's experience. Duval County, population 39,743, the largest county in the State, shows a death rate of 23.98 per 1000, and this indicates the next most successful attempt at registering deaths. When registration in all the forty-five counties of Florida have reached the efficiency of Monroe and Duval Counties, the Census Bureau will, in all probability, admit Florida to the company of "registration States." Though in doubt whether this can be done without the aid of a special act of Assembly, here is hoping that Florida may be the first of the Gulf States thus recognized.

LABORATORY WORK.

By Prof. F. P. Gorham, Brown University, Providence, R. I.

STANDARD METHODS.—The movement toward the adoption of standard methods in all laboratory work is certainly to be commended. In order to make the researches of various laboratories comparable some such scheme is necessary. The report of the Committee on Standard Methods of the Laboratory Section of the American Public Health Association has just appeared, and in connection with this report, in fact admirably supplementing it, will be the report of the committee appointed by the Society of American Bacteriologists in regard to standard methods of describing bacterial species. The preliminary report of the latter committee is about to be submitted to the bacteriologists of the country with request for criticisms and suggestions, before the final report is published.

The full report of the committee will be sent to all members of the Society of American Bacteriologists, to all members of the Laboratory Section of the American Public Health Association and to all others who apply or who are known by the committee. The committee consists of F. D. Chester, Delaware College, Newark, Delaware; F. P. Gorham, Brown University, Providence, R. I.; E. F. Smith, U. S. Department of Agriculture, Washington, D. C.

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THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH was organized in Boston, March, 1890, *with the following objects; The advancement of sanitary science; the promotion of better organization and co-operation among local boards of health, and the uniform enforcement of sanitary laws and regulations*

THE JOURNAL OF THIS ASSOCIATION has for fifteen years faithfully reflected the views of the public hygienists of Massachusetts. With the November issue of the year 1904, *the encouragement received from many hygienic quarters induced the Association to undertake the expansion of the Journal to a national standard, with the co-operation of many noted sanitarians as editors. A new title was selected, while the older and well-established title was retained also.*

The dates of publication are FEBRUARY, MAY, AUGUST *and* NOVEMBER *of each year.*

THE JOURNAL will contain the papers read at the meetings of the Association, papers contributed by hygienists, reports of the discussions, editorials, abstracts, reviews and hygienic notes of professional interest. Subscription rates, $1.00 *per year. Reprints furnished at cost price.*

All communications concerning the JOURNAL, copy, proof, subscriptions, advertisements, etc., should be addressed to the Managing Editor, DR. H. W. HILL, 739 *BOYLSTON ST., BOSTON, MASS.*

All communications concerning the ASSOCIATION should be addressed ta the Secretary of the Association, JAMES C. COFFEY CITY HALL, WORCESTER, MASS.

All bills not relating to the Journal, and MEMBERSHIP DUES ($2.00 *per year), should be sent to the Treasurer of the Association, DR. JAMES B. FIELD,* 329 *WESTFORD ST., LOWELL, MASS.*

EDITORIALS.

THE WRITING OF HEALTH REPORTS.

The time is approaching when it will be necessary for health officers to prepare their annual reports. These reports are nominally made to some superior officer, or to town or city councils. Their real purpose is to supply information to all the citizens concerning the workings of the department. They also furnish information to health officers in other cities, so that each community can make use of whatever methods have proved valuable elsewhere.

Unfortunately a good many health reports are carelessly prepared and are of little use to anyone. Whoever consults a health report, whether it be a citizen of one's own town or a brother health officer, should be able to easily find what is wanted. Everything should be as clear as possible and without ambiguity; hence, it is often necessary to define the terms that are used, and to take great care in the headings of tables, or in the explanation of methods pursued. For instance, it is a very common thing to read that so many loads of garbage were removed during the year. But the word "garbage" has very different meanings in different places, and even in one's own city the great majority of the citizens do not know what would be included in the term. Unless we know the size of the load there is no use whatever in stating the number removed. It is important to follow the same arrangement of subjects in every report, so that in looking over the reports it will be easy to find what is wanted.

It is very desirable that a list of all the officers and employees should be given. If there are many of the latter, of course the names need not be given, but merely the number. One of the most common inquiries is, how many are employed, what positions do they hold, and what are they paid? The latter should be indicated in the financial statement. It is a good plan, if possible, to describe very briefly under each department the main features of the work. This can be often done each year without taking very much space, and without much trouble, and is of great assistance to anyone seeking for this information. Another plan is to describe each year with great fullness some branch of sanitary work, and then to give the reference to this in some subsequent reports. It may be suggested that these descriptions will draw too heavily upon the printing fund, but in many cases by leaving out platitudes about municipal cleanliness, the triumphs of hygiene and the prospect of stamping out infectious disease, sufficient space could be saved for really useful descriptions of department work.

One very annoying thing in health reports is the absence of tables giving figures for a series of years. Almost everyone who takes up a health report wants to know not merely the deaths, cases of contagious disease, nuisances, food inspections, sputum examinations, milk analyses, prosecutions, amount of garbage removed, expenses, etc., for a single year, but he wants to compare them for a series of years, and tables showing these facts should be included in each report. Most of these tables, particularly those relating to infectious diseases and deaths, should go back as far as data are available, yet it is surprising to find how many of these tables in municipal reports are imperfect, or entirely wanting. In many health reports it is customary to exhibit deaths or cases of sickness by words, months, or in some other detailed manner. Yet I have not unfrequently found in such reports failure to give totals, so that if a person wanted to find out the number of cases in a given year he would have to add up the numbers for perhaps a dozen wards.

A great deal of really important scientific work is done by very many health officers, but it counts for nothing, because it is not properly preserved and made accessible to others.

Investigations of outbreaks of infectious disease should always be recorded with great care. Many such have been made in Massachusetts, and some of them are properly noted in local health reports, but many more are recorded imperfectly, or are not mentioned at all. Data in regard to sources of infection, duration of incubation, immunity to second attacks, persistence of infection, the occurrence of return cases after hospital isolation or after disinfection, the transferrence of infection by third persons, or by fomites, are all matters of very great moment. We need to know much more than we do about them all. Facts concerning some or all of them come to the notice of almost every health officer, and he should record them so as to increase the number and value of the data on which our future practice must be based. Every health officer should and usually does do something in the way of observation or experiment to increase the sum of sanitary knowledge, and he should record it carefully in his reports, and by so doing he will help others, and will make his future work still more accurate.

In some cities the vital statistics are published in a separate report; in such cases at least the gross death rate, and perhaps the death rate from some of the more important diseases should be included in the health report proper. In most cities, however, the health report includes at least the statistics of deaths. As a rule, these are extremely unsatisfactory. There is no excuse now for using any classification except the Bertillon, yet in many reports the causes of death will be found arranged alphabetically, and in others according to Farr's classification. When deaths are given with some detail as to seasonal or age distribution, as was suggested above, the total should always be given also. It is important to make use of ratios as much as possible, thus the death rate per one hundred thousand living, for the different causes, should be given. This is rarely done, and it detracts greatly from the value of the report. So in tables of age and seasonal distribution the percentage of deaths occurring during any one month or at any one age are useful. It is also important to give the total deaths and death rates for a period of years, and the same data for the principal causes of death for a series of years.

A good statement of the expenditures and receipts should form a part of every report. It is important to classify the expenditures as carefully as possible, so as to know just what is spent for disinfection, for laboratory work, for the control of contagious diseases, for the abatement of nuisances, etc. The same classification should be followed each year. Most reports err either in not having sufficient detail, or in having too much. No one cares to whom money is paid, or from whom it is received, but what they want to know is just how much is spent along certain definite lines. Unless there are strong local reasons why it should not be done, the salaries of the different officials should be shown in the financial statement.

If a health report covers more than fifty pages it should have an index, or at least a table of contents.

The great majority of American health reports are octavo, and all ought to be. It is a convenient size, and uniformity is desirable. Lastly, a report should be mailed in an envelope. No suitable punishment has yet been devised for the man who will roll up for mailing a health report, or any other pamphlet or manuscript. Health officers should look after their mailing lists and exchanges.

CHARLES V. CHAPIN.

THE AMERICAN PUBLIC HEALTH ASSOCIATION.

The recent meeting of the American Public Health Association in Boston was prolific in developments relating to the future of professional public hygiene in this country. Hitherto public hygiene has had scant recognition as a distinct profession—hardly has it been generally regarded even as an expert specialty. The address of the president, Dr. F. F. Wesbrook of Minneapolis ("Co-ordinated Specialism in Public Health Works"), was directed especially to emphasizing the importance of a general acceptance of public hygiene as a profession, related to, but distinct from, the practice of medicine. Inasmuch as the association took action by the appointment of a committee to consider and report on the suggestions made in this address, it is likely that a definite rearrangement of the relations of public hygiene to medical practice may be looked for in the near future. The committee is composed of well-known public hygienists, representing many phases of public health, and can be trusted as at once progressive and conservative in due proportions. The ex-officio members are the president-elect, Prof. F. C. Robinson, Bowdoin College, Brunswick, Me.; the chairman of the Laboratory Section, H. W. Clark, Massachusetts State Board of Health, Boston; and the secretary of the association, Dr. C. O. Probst, Ohio State Board of Health, Columbus, Ohio.

The appointive members are: Dr. H. M. Bracken, Minnesota State Board of Health, Minneapolis, Minn., chairman; Dr. Henry Mitchell, secretary New Jersey State Board of Health, Trenton, N. J., and Dr. H. D. Pease, director New York State Antitoxin Laboratory, Albany, N. Y.

The following instructions to the committee contain the recommendations which are to be considered:

The committee shall arrange and cause to be forwarded to each member of the association the grouping of programme material by March 1, 1906, and shall cause to be forwarded printed abstracts of papers and the final detailed programme not later than three weeks prior to the date of the next annual meeting, to all members of the association.

With the final programme and the abstracts shall be sent a printed draft of the committee's recommendations concerning the mechanism, including the exact wording of changes in constitution or by-laws which seems necessary or expedient, whereby the following improvements may be ensured:

(a) A board of trustees or small committee, representing the various phases of public health work, to conduct the necessary business of the association immediately before and after, and also between annual meetings.

(b) To increase the revenue of the association.

(c) To establish a permanent office or headquarters.

(d) To take charge of, print and distribute programmes and synopses of papers at the expense of the association, so that all members may be familiar with the plans of the association some weeks before the annual meeting.

(e) To publish the proceedings of the association and all its sections promptly.

(f) To publish a journal of hygiene and to promote a universal use by all State and provincial boards of health of the material contained therein. This shall be representative of all the interests of the association and contain the latest scientific material and standard methods in relation to practical application.

(g) To see that all Federal, State and Provincial Boards of Health and the Federal Sanitary and Medical Services are requested and do furnish in writing proper credentials, so that the Advisory Council may be more definitely and equitably constituted. Provision for representation of large cities should be considered.

(h) To arrange for a rigid classification of the membership into active and associate members.

(i) To arrange for a more thorough scrutiny of the qualifications of applicants for membership.

(j) To determine a policy in relation to the examination and granting of a diploma of public health by this association.

(k) To determine the feasibility and method of incorporating the Conference of State and Provincial Boards of Health as a Section of our association.

(l) To provide, if necessary, a municipal health officer section and such other sections as seem to be desirable.

(m) To formulate methods of influencing localities to a greater conservation and permanency of organization in their sanitary work and in their representation in our association.

OCTOBER QUARTERLY MEETING

OF THE

Massachusetts Association of Boards of Health.

The quarterly meeting of the Massachusetts Association of Boards of Health was held on Thursday, October 26, 1905, at the Hotel Brunswick, Boston. President Walcott presided, and about 90 members were present.

The records of the July meeting were read and approved.

Upon the recommendation of the Executive Committee, the following gentlemen were elected to membership:

P. M. Harwood, General Agent of the Dairy Bureau, State Board of Agriculture.

Dr. Allen F. Barnes, Bacteriologist, Cambridge Board of Health.

Dr. Henry J. Barnes, Boston, Professor of Hygiene in the Tufts Medical College.

Dr. A. Small, of Clinton.

THE PRESIDENT: A committee of your Association submits to the Association the following report:

Whereas, at the close of a long, completed life, Dr. Samuel W. Abbott has been removed from our midst, we, his associates, members of the Massachusetts Association of Boards of Health, desire to express our appreciation of him as a man, accomplished in matters pertaining to the public health, untiring in his work, and devoted to the interests of this Association.

We realize keenly the loss to this organization in the death of its Vice-President, who held this office since its formation.

Kindly, honest and upright in his dealings, careful and painstaking in his investigations and conclusions, his record as a member of this Association is an example to emulate.

HERBERT C. EMERSON,
JAMES C. COFFEY.

This resolution was adopted unanimously.

THE PRESIDENT: The first paper upon your programme for this afternoon is upon "Rabies," by Dr. Langdon Frothingham, whom I now have the pleasure of presenting to you.

RABIES.

By Langdon Frothingham, D. V. M.
Austin Teaching Fellow, Harvard Medical School.

I believe that Aristotle was the first observer who left to the world a careful description of Rabies. This was four hundred years before the Christian era. Since then no treatise on medicine has omitted this disease from its covers, and yet there are people today who deny its existence. But there are also those who refuse to believe in smallpox or diphtheria, and still others who deny the existence of all disease. I sometimes wonder what the destiny of this last class would be, if they were compelled to live in a densely populated city, unsurrounded by the innumerable precautions of preventive medicine, unprotected by those guardian angels—the Boards of Health.

There is, perhaps, no disease which is so surrounded by myth and superstition as Rabies. Homer's reference to the Dog Star, or Orion's Dog, is the supposed origin of the belief that this disease occurs chiefly during the dog days, and that outbreaks at other seasons must be another malady. As a matter of fact, statistics show that Rabies is just as prevalent in cold weather as in warm.

Pliny mentions a small worm in the dog's tongue, which, if removed when the animal is young, protects it against Rabies. Should this worm be carried three times about a fire and then given to persons bitten by a rabid dog, it prevents them from becoming mad. This process of "worming," absurd and cruel as it is, has come down to our own times.

A still very popular belief is, that if the dog is killed, the person bitten need have no fear of Rabies. Nothing could be more ridiculous. On the contrary, every effort should be made to keep the dog alive and under close observation in quarantine. Should he die of Rabies, the person bitten may then take the Pasteur preventive treatment, and animals which may have been exposed may be destroyed, or subjected to long quarantine. Should the dog, however, die of some other disease, or remain well, there is no danger to persons or animals bitten.

Rabies is an acute infectious disease, which may affect all animals, and even birds. I know of no warm-blooded creature which is naturally immune. It is more commonly observed in dogs, and the reasons for this are obvious. The saliva of this animal carries the infection, and it is, therefore, transmitted by his bite. The dog is by nature a biter. He bites without provocation and without discrimination, though other dogs are more prone to his attacks. Moreover, there is no animal with so many objectionable habits that is permitted such unbridled liberty. He walks about unmuzzled, unrestrained and unaccompanied, and often unlicensed and ownerless. A veritable vicious vagrant, it is small wonder that he suffers more than other animals from Rabies, and acts as the chief factor in spreading broadcast this terrible disease.

SYMPTOMS.—The symptoms of Rabies in the dog are manifold, and there is only time here to mention a few of the most prominent. The first that is noticeable is a marked change in the natural temperament of the animal. This may be of almost any kind; for example, the lively, amiable dog may become dull and morose; the unaffectionate, fawning and demonstrative; the noisy, silent; the silent, noisy. There is apt to be great restlessness, moving about without fixed purpose, hiding in secluded spots, starting suddenly, listening to imaginary noises, or the eyes following phantom objects. A depraved appetite is usually present; the animal not only licks stones, metals and other cold objects, but he chews and swallows all kinds of foreign bodies, sticks, stones, straw, paper, pins, nails, etc., anything that comes within his reach. He may lick the place where he was bitten, and even gnaw it until it becomes raw and bleeding. There is at this time little or no disposition to bite. Any such symptoms as the above, or any evidence of mental disturbance, should be looked upon with suspicion in infected districts and warrant immediate isolation and strict quarantine.

The symptoms now assume one of two very definite characters, which has led to speaking of "furious" or "dumb" Rabies. The words explain themselves. In the furious form, the dog tends to roam and bite everything that comes in its path, more especially dogs and other animals. He bites without preliminary snarl or growl, and goes on to the next object, unless attacked in return. He develops a peculiar howl, something like the bay of a hound, which is said to be diagnostic by those who have once heard it. He may run for miles—fifty or more—spreading infection as he goes. Paralysis gradually ensues, beginning with the posterior extremities, and the animal soon dies, if not put to death by someone who has joined the chase. There is no hydrophobia or fear of water. The rabid dog will swim rivers and plunge its head into water, vainly endeavoring to drink, but, owing to a paralysis of certain muscles, it is unable to do so. When confined, and so prevented from wandering, paroxysms are interspersed with periods of torpor. Not uncommonly the dog acts as if endeavoring to remove a bone or other foreign body from the throat.

The dumb or paralytic symptoms are usually first observed about the mouth. The lower jaw hangs partly open, limp and helpless. Saliva drools profusely from the lips. The mucous membrane of the mouth becomes bluish; there is no desire, and probably no ability, to bite. One can never forget the truly pitiful face, the imploring eyes gazing at their master, begging relief from an unknown horror. Paralysis soon shows itself in the hind legs and advancing forward, there is complete prostration and death in a few days.

Besides these typical forms there are, of course, intermediate grades tending either toward the furious or the reverse.

The symptoms in other animals are similar in a general way to those of the dog. They vary with the kind, nature and disposition of the animal affected. The horse may bite and kick; the cow may kick and horn; swine rush aimlessly about, squealing and biting. There is always evidence of great mental derangement. In man alone is there hydrophobia, and this is probably due to the fact that paralysis of certain muscles prevents him from drinking, and the attempt brings on a paroxysm.

INFECTION.—Rabies is usually transmitted by the bites of rabid wolves, or other wild animals, or of the dog. Infection does not always result from a bite. Bites upon the face, hands, or other exposed parts of the body are more likely to result disastrously than those inflicted through the clothing, since the passage of the teeth through any covering may clean them and wipe away the virus. For the same reason long-haired animals are more protected than short. A free flow of blood from a bite must also be looked upon as a safeguard against infection. "Under favorable circumstances, however, every bite infects." The disease may also be transmitted without the bite by particles of saliva coming in contact with abraded surfaces. It has been conveyed, experimentally, by making animals breathe atomized, infectious fluids, and also by feeding infectious material.

The period of incubation varies very widely. The average time from infection to symptoms is between fifteen and sixty days, but it may be as short as ten days, and there is good reason to believe that symptoms may not appear for a year, or even longer, after a bite.

TREATMENT.—When symptoms have once set in, curative treatment is useless and almost criminal in the lower animals, when we consider the risk of preserving and propagating the infectious agent. Very exceptionally recovery will take place, yet the frightful danger attending any such hope prevents the experiment, except under the closest quarantine. The immediate treatment of bites is of the utmost importance. They should be made to bleed as profusely as possible by pressure, then thoroughly cleaned and cauterized. Fuming nitric acid is probably the best for this purpose, superior even to actual cautery, or strong nitrate of silver. The nitric acid should be applied within twenty-four hours after the bite. (Cabot. Medical News. 1899.)

Persons bitten by rabid animals should take the Pasteur preventive treatment as soon as possible. This treatment consists in the injection of the attenuated virus of Rabies, beginning with a virus so weak that infection is impossible, and gradually increasing the strength until the system resists the strongest virus. This treatment is attended with no danger, and grants immunity to the individual, except in a very few instances. For example, of 2,872 persons bitten by animals proved to have been rabid by inoculation only twenty died; a mortality of only .69 per cent.

Recent reports from Italy awaken the hope that Radium may, before long, prove very valuable as a curative agent.

DIAGNOSIS.—An early ante-mortem diagnosis in the dog is of great importance, as it is then possible to confine the animal before the desire to bite has developed. In districts where Rabies has existed, or animals have been bitten, dogs should be most carefully observed, and any deviation from customary habits should be looked upon with suspicion, and warrant immediate isolation. In such cases, if undoubted symptoms of Rabies ensue, the animal can be destroyed, otherwise no harm has been done.

There are numerous nervous affections of the dog which simulate Rabies, and it is generally true that only a veterinarian with some experience of the disease is able to make a diagnosis. Indeed, there are many instances where a doubt as to the correctness of the diagnosis may properly exist. In such cases, and especially where persons or animals have been bitten, an absolutely correct diagnosis is of the utmost importance, and this has to be made after death. Unfortunately, a post-mortem examination does not give the desired result. It can at best only arouse, not confirm, suspicion. The cause of Rabies is still unknown, so that it is impossible to isolate it and thus make a diagnosis. Therefore, for many years animal inoculation has had to be resorted to. The method recommended by Pasteur is still used, with slight modifications. It consists of injecting directly upon, or into the brain, of rabbits or guinea pigs, a suspension of the brain or cord of the suspected rabid animal. If really rabid, the animal thus inoculated will show symptoms of Rabies sometimes as early as ten days, usually between fifteen and thirty days, though symptoms may be delayed as long as ninety days. Yet the inoculation being made thus directly into the central nervous system, symptoms appear, with very few exceptions, before they do in persons who have been bitten, and there is still time, therefore, for them to take the Pasteur preventive treatment.

For years other means of diagnosis have been sought, not only that a more rapid result might be obtained, but that unnecessary sacrifice of animal life might be prevented. For instance, very definite lesions in the plexiform and Gasserian

Ganglion have been described as occurring in Rabies, and they undoubtedly exist in the majority of cases. But they sometimes fail, and moreover, it has not been definitely established that similar lesions may not occur in other nervous disorders, so that this means of diagnosis did not prove fully successful, and animal inoculation was still a necessity.

Recently an Italian observer, named Negri, has fully described certain definite inclusions in the cells of the Ammonshorn, which he claims are protozoa, and the cause of Rabies. These bodies vary much in shape and size, and can be made out with ease only in properly fixed and stained sections of the Ammonshorn or cerebellum. Negri and others have found them present in all but a few cases of Rabies, and only in Rabies, and the assertion is that they are diagnostic.

The present extensive outbreak of Rabies in Massachusetts has given me an opportunity to carefully follow Negri's work. I confess that I was very skeptical at first, but from being a skeptic I have become a firm believer. At first it was necessary to inoculate animals to confirm the diagnosis, but my own results added to voluminous reports from abroad seem to make this step unnecessary, except in a few cases where Negri Bodies are not found in sections. I have succeeded in reducing the ordinary time of three days, necessary to obtain sections, and, therefore, a diagnosis, to less than twenty-four hours. Also, by means of impressions of cross cuts of Ammonshorn upon glass slides, I have succeeded in finding Negri Bodies in a much shorter time. In the majority of cases I feel that I can now make a diagnosis by this method in two hours after the suspected brain has reached the laboratory.

I feel that the presence of these bodies are as diagnostic for Rabies as the bacillus of Tuberculosis is for tuberculosis, or the Klebs-Loeffler bacillus for diphtheria. In fact, I believe that this means of diagnosis is as correct as any bacteriological test that we have at the present time.

Before closing, I wish to say a few words regarding prevention, which is, as you all know, a thousand times more valuable than cure. It is perfectly possible to prevent Rabies, a fact that has been demonstrated time and again, and I believe the best preventive measures are the following:

First: Reduce the number of dogs as much as possible. This can be accomplished by proper license laws, strictly enforced.

Second: Limit the uncontrolled roaming of dogs by chaining or otherwise confining them, or taking them about only on the leash.

Third: Prevent them from biting. This can only be done by strict muzzling laws. Experience has shown that wherever muzzling has been well enforced Rabies has soon disappeared. The unfortunate sentiment against the muzzling of dogs is largely due to the efforts of a number of well-meaning people who consider it a cruel practice; but anyone who has had the slightest experience with muzzling will inform you that the most refractory dog becomes perfectly reconciled to the muzzle in a few days. It is indeed deplorable humanitarianism that permits the possibility of untold suffering to man and animals, that a few dogs may be saved a slight annoyance.

THE PRESIDENT: Dr. Frothingham's extremely interesting paper is before you for discussion. This Association and the Commonwealth looks to your department, Dr. Peters, for protection. We shall be glad to hear from you.

DR. PETERS: Mr. Chairman, Ladies and Gentlemen,— Dr. Frothingham's remarks on Rabies are of more than ordinary interest just now because of the prevalence of Rabies in Massachusetts at the present time, and it gives me a great deal of pleasure to be able to be here today and supplement his remarks with a few words in reference to the outbreaks during the past season.

On looking over a barrelful of old sermons a few days ago, I find that I preached to this congregation upon the subject of Rabies in January, 1891, fifteen years ago next January. It impresses upon one the age which this Association has attained, and gives added force and significance to its deliberations.

During 1889 and 1890 an outbreak of Rabies occurred in this State somewhat similar to the one that we are now going through, and it was this outbreak that led to the discussion of Rabies at the January meeting in 1891. I remember saying at that time that "Rabies, like all epizootic diseases, is at times very prevalent, and then, after a varying duration, becomes very much less frequent, and finally is seldom or never heard of until a fresh outbreak occurs." The outbreak of 1889 and 1890 gradually subsided until it finally disappeared. For a while Rabies was practically unknown in this State. There was not a case of Rabies reported to the Cattle Bureau Office, which proved to be positive, between September, 1903, and November, 1904. That is, for a period of fourteen months, so far as is known, the State was apparently entirely free from it. There were two cases prior to November, 1904; one in September, 1903, when a dog belonging to a travelling vaudeville actor had Rabies, which may have been bitten outside of Massachusetts; the other case was a green Western horse, in July, 1903, which was probably bitten outside of the State before he was shipped here from Indiana.

Since last November several sporadic cases have been reported, and later there have been two serious outbreaks and two or three minor ones. One of the two large outbreaks was in Lowell last winter and spring; the other, which has not subsided yet, started in Northbridge the end of last July. Where an outbreak of Rabies occurs, dogs that have been exposed in the neighborhood, which are known to have been bitten or which may have been bitten, have been ordered quarantined on the premises of the owners. Counting such cases, the total number of animals which have been reported as having Rabies, or suspected of being infected with Rabies, has been 229. Of these, 223 were dogs, one cat, one cow, three calves, and one swine. Of these 229 cases, 157 are those spoken of as being quarantined. The number of cases positively diagnosed as Rabies is 65. Dogs suspected of having Rabies and examined have proved negative in 13 cases. Thirty-three dogs have died or been killed by their owners without an examination at the medical school, and 60 dogs have been released from quarantine at the expiration of ninety days, having shown no symptoms from the time that they were exposed to a rabid animal. There are now remaining in quarantine 58 dogs.

Among the animals which have died of Rabies have been a cow, three calves and a pig. Two persons died in Lowell last spring, both of whom went to New York and took the protective inoculation furnished by the New York City Board of Health. One, a woman, died soon after returning home; the other, her father, died about a month later. These two people were bitten very severely on the face and neck, which accounts for the failure of the anti-rabic treatment in their cases.

Cases of Rabies have occurred in the following towns:

Milton,
Tyngsborough,
Watertown,
Northbridge,
Douglas,
Clinton,
Northborough,
Marlborough,
Boxford,
Framingham,
Upton,
Hopedale,
Milford,
Holden.
Leominster,
Lowell,
Weston,
Newton,
Waltham,
Grafton,
Lancaster,
Uxbridge,
Maynard,
Topsfield,
Mansfield,
Westborough,
Mendon,

Where an outbreak occurs in a town, the following notice is sent to the inspector of animals to post, with his name and the chief of Cattle Bureau's printed at the bottom:—

"A number of cases of Rabies have occurred recently among dogs in Worcester County, and it seems quite probable that more cases may occur in some of the towns. It is the duty of every one, therefore, to co-operate with the State and local authorities in doing everything possible toward the suppression of this disease.

"In towns where Rabies exists the selectmen have the necessary authority to order all dogs running at large to be muzzled, under Section 158 of Chapter 102 of the Revised Laws. A muzzling order should require dogs to be properly and efficiently muzzled for at least sixty days—ninety days would be better.

"All persons are cautioned against the danger of attempting to pet or fondle strange dogs.

"Any person noticing a dog acting in a peculiar or unusual manner should at once notify the local inspector of animals.

"If a dog should bite any one, it is unwise to immediately destroy it, if it can be secured without its doing further harm, as a dog suspected of having Rabies should be securely chained or shut up in a box stall for a few days, where it can be observed. Tying with a rope is unsafe, as the dog might gnaw the rope in two and escape. If the dog remains well, it is certain that it is not rabid, and the person bitten need have no cause for alarm. If the dog should die, or is killed on suspicion of having Rabies, the head should be sent to the Chief of the Cattle Bureau of the State Board of Agriculture, who will have it examined in order to ascertain whether it had Rabies or not. If there should be good grounds for suspecting that a dog so examined had Rabies, and it had bitten anyone, a report will be made to the person bitten, or the attending physician, in order that the injured person can go to New York for the anti-rabic treatment furnished by the

New York City Board of Health, if the patient desires to do so. If a dog suspected of having Rabies is to be killed, it is preferable to have it chloroformed when possible, as shooting injures the brain so as to render it of less value for examination.

"If a dog suspected of having Rabies bites any dogs or other animals, the animals bitten are to be quarantined by the Inspector of Animals, as provided for by law, and the owners must keep them under restraint until notice of their release is sent them by the Chief of the Cattle Bureau.

"The police or other dog-licensing authorities should be particularly stringent in enforcing the dog license law. All homeless or ownerless dogs should be killed. All persons owning dogs should be made to have them licensed, as provided for by law, and all dog owners should feel a greater sense of responsibility at this time than when usual conditions prevail."

The following notice has been sent to all owners of dogs quarantined:

Commonwealth of Massachusetts,
Cattle Bureau of the State Board of Agriculture.

NOTICE.

To Dog Owners, or Persons in charge of Dogs quarantined, in order to prevent the spread of Rabies.

All owners or persons having charge of dogs quarantined under the provisions of Chapter 90 of the Revised Laws and Chapter 116 of the Acts of 1902 are hereby notified that dogs so quarantined are to be kept securely CHAINED, or shut up in a box stall or other suitable enclosure on the premises where they are quarantined, and that under the provisions of the law they cannot remove or kill any animals legally quarantined, without the permission of the Chief of the Cattle Bureau.

As dogs suspected of having been bitten by a mad dog cannot be safely allowed to run at large until the expiration of ninety days from the time that the bite may have been inflicted, it is possible that some owners may prefer to kill animals to which they are not particularly attached, or that have but little value.

Permission to kill such dogs is hereby granted under the following conditions: An owner desiring to kill a dog in quarantine is to notify the local Inspector of Animals, or an agent of the Cattle Bureau, and either the inspector or the agent is to be present when the dog is killed and report the killing of the same to the Chief of the Cattle Bureau.

————————————,
Chief of Cattle Bureau.

State House, Boston, Oct. 2, 1905.

In many of the towns where Rabies has occurred in Worcester and Middlesex Counties, the selectmen have issued orders as provided for in Section 158 of Chapter 102 of the Revised Laws, ordering all dogs running at large to be properly and securely muzzled, or else kept under restraint on the owner's premises. Muzzling orders of this kind have been issued by the selectmen of Northbridge, Douglas, Clinton, Northborough, Grafton, Uxbridge, Westborough, Mendon, Upton, Milford, Hopedale, Lancaster, Leominster and Holden. The Mayor and Aldermen of Marlborough have also ordered all dogs in that city muzzled or restrained. Where this is done, and where the police destroy all stray and ownerless dogs, much can be accomplished toward eradicating the disease.

It is probable that after Rabies disappeared from Massachusetts it was reintroduced by dogs coming from without the State, as the following instances demonstrate how it may be brought from a distance. About the first of June a bull terrier was brought to Auburndale from Wayne, Pa. Two or three days after arriving at his master's place he ran away and was found in Weston, with a stray brindle dog with bat ears, appearing at a gentleman's place there. He had been advertised in the newspaper as lost, and the coachman caught him and returned him to his owner. After being brought home the owner noticed that the dog was not well, and took it in to a veterinary hospital in Boston, where he was informed the dog had Rabies. A dog bitten at the gentleman's place in Weston afterward developed Rabies and died. What became of the bat-eared friend that was with the bull terrier has never been known, as he afterward disappeared and has not since been heard from, but it is not impossible that he may have been bitten by the dog from Pennsylvania and afterward developed the disease and attacked other dogs, which may account for the outbreak at present in Worcester and Middlesex Counties. Another case which has recently been brought to my attention is the appearance of Rabies in Boxford, on the premises of a man who trains bird dogs. A few weeks ago a setter was brought to his place from Virginia, which later developed Rabies, although it was not known what the trouble was at the time. Later another setter bitten by this dog developed Rabies. The result is that all the dogs on the premises have been quarantined for ninety days. Another dog owned by a neighbor, bitten by the second animal that had Rabies, is also in quarantine. It is hoped that quarantining these animals will prevent the further spread of the disease in this locality.

I believe Rabies has been exterminated in England, and all dogs now brought there are not allowed to enter except upon a permit from the English Department of Agriculture, and are held in quarantine for ninety days after arrival. Rabies is unknown in Australia, for the reason that all dogs that have ever been brought there have been kept in quarantine for ninety days after arrival before being allowed to run at large. If Massachusetts was sufficiently isolated, regulations providing that no one could bring a dog into this State without a permit, and that all dogs brought here must be kept in quarantine for ninety days after arrival, would serve to keep the State free of disease after it was again eradicated in this Commonwealth. But our position does not permit of this, as dogs could run in from neighboring States without it being possible to prevent it, and in this way some rabid animal might reintroduce the disease at any time, even if it should disappear here.

Two cases that have recently come to my attention are of interest, showing the ground that a rabid dog will cover in a short length of time. A few weeks ago a dog ran from Grafton, where we have been having trouble with this disease, to Kingston (a distance of about fifty miles), leaving home on Sunday and appearing in Kingston early Monday morning. He died with Rabies Thursday or Friday of that week. Fortunately this dog was muzzled, because of the order of the selectmen of Grafton ordering all dogs running at large in town to be muzzled. Judging from the size of the muzzle, I think the strap around his nose was sufficiently tight to prevent his having done any harm to other animals. About ten days ago a dog in the northern part of Framingham became rabid and ran to Holden, a distance of twenty-five or thirty miles. This animal bit several people, who, I believe, have gone to New York City to take the preventive treatment furnished by the New York City Board of Health.

The shortest length of time this summer in which Rabies has developed in a dog after being bitten by a rabid animal has been a little less than two weeks, I think about twelve to thirteen days, and on the other hand a period of six or seven weeks has elapsed between the time an animal was bitten and its developing the disease. As a rule, a quarantine period of ninety days appears to be ample, although rare cases have been cited where the disease has not developed until a year or fifteen months after a bite of a rabid animal. Such instances, however, are very unusual.

At the time of my discourse, nearly fifteen years ago, I presented the texts which I preached from at the end of my homily instead of at the commencement, as is customary in most sermons. I will give you the same texts again today, as they are as good now as they were then. One is from Psalms, xxii.:20: "Deliver my soul from the sword; my darling from the power of the dog." The other is from St. Paul's Epistle to the Philippians, iii.: 2: "Beware of dogs." I give you the choice of either, or both.

THE PRESIDENT: Is there anything else to be said upon this interesting subject?

A MEMBER: Will Dr. Frothingham tell how he cauterizes?

DR. FROTHINGHAM: I am asked the method of cauterization. I have advocated the method of cauterization with nitric acid, strong, fuming nitric acid, based upon certain experiments by Dr. Follen Cabot of the New York Board of Health a number of years ago. This simply means, after the wound has been thoroughly cleaned, applying the strong nitric acid directly to the wound and allowing it to remain there.

DR. FRENCH: I would like to ask Dr. Frothingham his opinion about how much delay it would be safe to make in a suspected case before this treatment is commenced. He speaks in his paper about quarantining a dog and waiting a little time until he finds whether it is rabid or not. Now, what would be the chances of recovery between immediate treatment, supposing it was hydrophobia that affected the animal, and waiting a few days or a week?

DR. FROTHINGHAM: I think it is perfectly safe to wait for a number of days. Certainly our laboratory experience has shown us in the past that, where we inoculate rabbits or guinea pigs, and they show no symptoms of the disease for three weeks, it is still ample time for a person to take preventive treatment. Of course, the great danger comes in the cases where the bites have been inflicted upon the face and where the bites are very severe. In those instances infection may take place almost as rapidly as it does in our experiment animals, but it cannot be quite as rapid, because in our experiment animals we introduce the virus directly on to or into the brain, whereas of course from a bite it has to travel from the periphery to the centre. As a general rule, it is perfectly safe to wait until an animal inoculated has shown symptoms; but in view of our present rapid means of diagnosis, I think it is always advisable to take no chances whatever. The moment that a report comes from a laboratory that the animal is suspected of being rabid, I think that the best thing to be done is to go at once and take the Pasteur treatment.

THE PRESIDENT: The next paper of the afternoon is one, entitled "Notes from Recent Meeting of American Public Health Association," by Mrs. Richards, whom I now have the pleasure of introducing to you.

NOTES FROM RECENT MEETING OF AMERICAN PUBLIC HEALTH ASSOCIATION.

By Mrs. Ellen H. Richards,

Instructor in Sanitary Chemistry, M. I. T.

The thirty-third annual meeting of the American Public Health Association was a notable one in several respects, besides marking the progress of a third of a century. Although the American Medical Association is an older organization, the formation of a section for the discussion of State medicine and public hygiene is of comparatively recent date, so that it may safely be said that this was the first national organization for the promotion of sanitary science and public health.

It was organized in 1872, by men inspired with enthusiasm to do for America what the Prince Consort and Edwin Chadwick, the father of sanitation, had been doing for England. The first English Board of Health was short-lived, 1848-1854, but was followed by many volunteer organizations.

There are four names of the charter members of the A. P. H. A. still on the list. There are 29 who joined previous to 1880. Of these, five were present at the Boston meeting, one of 1874, three of 1875, of whom our vice-president, Dr. Durgin, was one (he must have been a mere lad, a precocious youth). The early members were, as a rule, naturally largely medical men, but in the eighties a few of us outer barbarians, chemists and the like (there were no bacteriologists), were admitted.

Its work fell naturally under three heads:

(1) The securing of that public opinion upon which laws depend and the enforcing of those laws. Work of health boards and government officials. This part of public health is now the chief object of the National Conference of State and Provincial Boards of Health, organized in 1884.

(2) The investigation of special sanitary problems, as car sanitation, smallpox, etc., which require the co-operation of the officers of several States or countries. For the past twenty years, water supply and sewage disposal problems have been added; the interest in these culminating in the formation of the Laboratory Section, now a most active part of the Association, bringing in chemists, bacteriologists and engineers, mostly young men laboratory-trained, eager to put their knowledge into the field. Twenty-eight papers were presented in this section. Of the present membership of about 500; 225 have joined since this section was formed in 1899.

Not only individuals, but organizations may join, libraries and Boards of Health, as such, to obtain the publications which are of increasing value. Not one Massachusetts Board of Health has availed itself of the privilege, or had up to last year. Manchester, N. H. has.

(3) The third part of the work which was fully recognized as most important by the founders, but which for a few years has been overshadowed by the rapid increase of knowledge, is the education of the public whose health is to be improved by the laws and regulations imposed. The prize essays were an example.

It is noteworthy that at this Boston meeting, besides papers on communicable disease and tropical medicine, one session was devoted wholly to methods of securing more uniform instruction and co-operation in health work, and in the papers on other days there came out constantly the fact that ignorance of the common rules of clean living was responsible for the spread of the usual contagious diseases. This was admirably illustrated in Dr. Park's study of meningitis in New York, where careless habits seem to have carried infection without question. Out of 1,500 cases known, investigation revealed the fact that two hundred of them were clearly in direct contact with other cases, and that many of these showed evidence of infection from other cases. The conclusion is drawn that the meningococci are spread by the discharges from the nose and mouth of the sick, and those in immediate contact with them (hands and handkerchiefs), or the lack of the latter.

The same thing came out most forcibly in the spirited discussion on car sanitation. The railway officials showed that they provide cleanly devices just as fast as the public will make use of them. (Indeed, it seemed as if the speakers themselves, supposedly keen on sanitary points, were more concerned about having to brush their teeth in ice water than in the possible dissemination of disease by the wholesale scattering of excreta along the track, from whence every windy day will carry the dust to cities miles away.) For one carefully guarded Pullman, 10 to 20 day coaches go over the same route.

The moral effect of restrictive measures was fully recognized, but also the value of teaching the people to take care of their own premises. Dr. Dudley brought that out in relation to the use of personal drinking cups, and to coat-brushing on the trains. In fact, after this discussion one felt like hanging one's head in shame for this boasted American civilization.

As Dr. Chapin says, "stringent measures cannot stamp out disease." It is, then, by the education of the masses, and by that only, that we can hope to approach possible freedom from disease.

It is satisfactory to know that the wild beast can be tamed and made harmless, once he is in the corral, but that is no comfort while he is abroad. We are glad of all that the Laboratory Section can tell us of how easy it is to recognize the various cocci, or to make sewage fit to drink, but we would like to know that the restaurant cooks and waiters keep their fingers clean and that Italian laborers do not wash their soiled linen in our water supply, as was found to be the case on the New York watershed the other day.

If it is true that nine-tenths of us carry pneumonia germs all the time, it is equally true that civic cleanliness can never be forced upon a free people. Education alone can make the people take pains to avoid scattering infection.

Education, not only in the meaning of words and laws, but in the absolute necessity of habits of personal cleanliness. In the school—because habits are formed early; by public meetings and popular but correct literature, because people are influenced. We need not wait until we know the last detail. As Dr. Dudley said: "Under the false impression that sewer gas was dangerous, we made every one attend to his drains—but it did them no harm to clean up."

A few quotations will show the trend of the dozen papers on education:

"There is, however, a real necessity for the education of the layman in regard to public health matters, not only for his own good, but for the good of the community as well. It will enable him to properly appreciate preventive measures and give the necessary co-operation to public health officials in their attempt to control communicable diseases, by securing early and correct diagnosis, etc."

"The most desirable class of people to reach at this time are educators, including school teachers, preachers and journalists. The work should be introduced into all institutions of higher education, as universities, colleges, theological seminaries and normal schools."

". . . the value of well-conducted State public health associations, conference of State sanitary officers or of schools of instruction as means toward the further improvement of the work of local health officials is presented."

". . . in ten States there are conferences or schools controlled by the central authorities, and five more are seriously considering their inauguration."

"The argument is presented that from these instructive meetings there could be a more or less gradual development of them into regular and possibly obligatory courses in sanitary science and public hygiene for health officers conducted by the State authorities."

Sanitation especially necessary; does not need a physician to attend to it, as many forms of personal hygiene require. In this time of crowded school courses it will be helpful to divide the work, allowing sanitation a place apart from hygiene.

"There is still the uneducated public to be reached, and a far harder problem is to reach a large and apparently growing class of the educated public."

THE PRESIDENT: The Association apparently assents to every word that Mrs. Richards has said.

The next paper is upon "Recent Outbreak of Typhoid Fever in Springfield," by Dr. Magrath.

THE RECENT OUTBREAK OF TYPHOID FEVER AT SPRINGFIELD.

By George B. Magrath, M. D.
Assistant to Secretary Mass. State Board of Health.

Early in September of the present year, by reason of the increasing prevalence of typhoid fever in Springfield, the State Board of Health directed that an investigation be made as to the cause of the outbreak. The writer spent some two weeks in the study of the conditions, and with the assistance of the Board of Health, the Board of Water Commissioners and the Inspector of Milk of the city of Springfield, was enabled to study the situation from every point of view. By investigating as thoroughly as possible a large proportion of the reported cases of typhoid fever, and by studying the different localities in the city in which these cases occurred, it was possible to collect a large number of facts bearing upon the epidemic.

Prior to the outbreak of typhoid fever in the latter part of July, scattering cases of the disease had occurred during the late winter and early spring, in all about thirty cases. It is not apparent that these cases have any direct bearing upon the general epidemic, although certain of them are, undoubtedly, concerned with certain foci of the disease which developed later.

The geographical plotting of the cases reported in this epidemic shows a distribution over the city such as to spare consistently the better residential districts, Indian Orchard, and the village of Ludlow. A tour of inspection showed that the regions where the cases were most numerous were those occupied by the poorer, and in many instances the poorest, people in the city. This geographical and sociological distribution, together with a survey of the water supply of the city, seemed to eliminate this from responsibility as a vehicle for contagion. The cases followed no line of water distribution, developing in localities with different water supplies.

Furthermore, the distribution did not change with alteration of the water supplied to these various regions, and entire localities were exempt from typhoid fever, although supplied with the same water as that used in the infected districts.

In Springfield the localities nearest the source of water supply, and, therefore, the most liable to infection, are Ludlow and Indian Orchard. These districts, which are probably but slightly protected by filters or boiling, were practically exempt from the disease, while in the city proper those wards lying in the most direct line of the water supply were the wards with the fewest cases. These facts seem to be wholly inconsistent with a water epidemic.

An analytical study of the cases with respect to milk supply showed it to be impossible to correlate the general epidemic with milk as a distributing agent. In no instance has the number of cases in different locations exceeded one per cent. of the families supplied from any given source.

From investigations carried on by the local Board of Health it seemed improbable that ice was a factor.

These various possibilities, upon careful study, failing to explain the epidemic, attention was directed to the closer study of the regions in which the cases were most numerous, of the relation of these regions to one another, and of the conditions prevalent within them, and, further, to the distribution of cases in time when classified according to the onset of the disease. A study of the localities in which the cases were most highly concentrated showed these to be divided naturally into groups, and a study of these groups proved them to have in common the general character of their population, for in all there was a predominance of those paying very low rent. The nationalities represented in these groups are varied.

A study of the cases chronologically throws them into periods each of about twelve days' length, with an interval of two or three days, the first from July 15 to July 29, including nineteen cases; the second, between August 7 and

August 18, including twenty-two cases; and a third, between August 21 and September 2, including twenty-seven cases. Subsequent to the latter date cases occurred with less of periodic arrangement. This periodicity seemed to point to repeated infection and suggested a vehicle of contagion by means of which this would be possible and which would be especially active in regions with a population such as has been described as existing where the cases of typhoid fever were most numerous.

Investigation of the locality in which the greater part of the cases occurred which constituted the beginning of the epidemic, in the latter part of July, showed conditions peculiarly favorable to the spread of typhoid fever by contact or by the medium of fruits and vegetables. This region is one in which the standard of living is so low as to be consistent with a high degree of uncleanliness, alike personal and domestic, and also one in which, through the existence of vaults and of other unsanitary conditions, the occurrence of any considerable number of typhoid cases is rendered a distinct menace to the community. It was found, moreover, that in this region many peddlers of fruit and of vegetables either live or do business, in the conduct of which much handling of their wares by the prospective purchasers was inevitable. It was at once evident that if any infected material was present on the hands of any persons handling fruit or vegetables, or such vegetables as are eaten uncooked, or bread, it would be transferred to any article sold in this manner. A survey of the streets in this region demonstrated that practically all of the supplies for the population of the locality were sold in this manner. Associating with these conditions the fact that in a number of instances cases of typhoid fever occurred in the families of these small venders themselves, conviction was inevitable that typhoid fever, especially in the later periods of the epidemic was due at least in considerable part, to the passing on of infection by this means. It is evident that the more or less clearly defined groups of later development might be attributable to such a cause as this, so long as the contagion remained prevalent in the classes supplied by these venders, and it was apparent that these venders were in the habit of distributing their wares very largely in the region where these groups developed. In addition to the means of spread above outlined there has, in all probability, been operative locally in the spread of this epidemic transmission by means of flies, for it is certain that in particular localities conditions have existed highly favorable to spread by this means—open vaults, broken windows, domestic uncleanliness, coupled with the occurrence of cases of the disease, furnishing all that is required for such transmission. In certain localities of this sort there seems to have been local spread, the time relations existing between later and earlier cases tending to show an inter-relation between them.

Regarding the later periods of the epidemic as capable of explanation in the ways outlined, the explanation of the epidemic as a whole is to be sought in the study of the cases which occurred in the latter part of July in the vicinity of Sharon and Ferry streets. Investigation of these cases brought out the fact that in almost every instance the fruit and vegetable supply was obtained from peddlers—and in a considerable number of cases from a particular vender—some of whom, it was stated, were furnished exclusively from his supply. The route of this particular vender was ascertained and was found to cover every street in the region where the epidemic started and to extend into several others where the cases of typhoid fever in the Hampden County jail, an insti- particular peddler was found to be rather indeterminate, inasmuch as he obtained his produce alike from the larger markets and from farmers. There is no reason to suppose that his stock at the time of purchase was infected.

The somewhat anomalous fact of the occurrence of several cases later became prevalent. The source of supply of this tution which is a model of cleanliness and of good order, seems the less remarkable if it be conceded that infection may be carried by flies or by other media than water or milk.

It seems to the writer highly probable that the conditions under which the inhabitants of the regions of the city where typhoid has been most prevalent live, tend to facilitate the spread of any infectious disease. In the case of typhoid fever, the exposure of infected excrement, even if it be that of a single case only, under proper seasonal conditions may in such regions lead to the spread of the disease and, therefore, constitutes a menace to other parts of the city. Not a few of the cases which are ordinarily called secondary, that is, in which the infection is from one person to another in the same family or among near relatives, are due, in all probability, to the presence of open and unsterilized vaults accessible to flies.

The study of the facts has led me to the following conclusions:

1. That the epidemic was not due to infection of water supply.

2. That the epidemic, as a whole, was not due to the distribution of infection by milk.

3. That the spread of the disease locally, to the extent of its becoming in a sense epidemic, was due to the occurrence of typhoid fever in regions physically adapted to the spread of the disease by contact and to the distribution of infection from it to other regions through the medium of fruit, vegetables and possibly other food materials infected by handling.

THE PRESIDENT: The paper is before you for discussion. Dr. Emerson, we shall be glad to hear from you.

DR. EMERSON: Mr. President, I want to say, in the first place, that in many things I agree perfectly with Dr. Magrath, because later I am going to disagree with him. It certainly has been a puzzling epidemic, and its source, as the epidemic progressed, was difficult to trace.

There are two subjects which you will almost always be sure of hearing the Springfield people talk about wherever they are. One is water, and the other is typhoid. We have, many of us at least, talked the double subject this last summer.

The cause of the early cases in the lower part of the town, as Dr. Magrath has described, is uncertain, that is, of the late July cases, and we are in doubt how the original infection occurred. We believe that every chance has been offered for a distribution to a certain extent of typhoid by contact, and very likely by flies in some instances. Very likely some of the cases have received their infection from local conditions, some from the wells possibly, one or two in boys, who may have gotten it from being in the river, and so on.

The incidents of typhoid in Springfield, as far as we have a record during the past seven years, shows on the map practically the same picture which we have had this year, only there are more cases this year; that is, there always have been more in the lower level part of the city than above; there has always been in this vicinity here and in the upper region a very similar distribution.

In regard to the water supply, as Dr. Magrath said, it is somewhat complicated, and I won't attempt to go into it in further detail than he has done.

In looking at the course of the epidemic now, and taking into account all the cases, I believe, if I heard correctly, that Dr. Magrath did not particularly take up the cases in the upper portion of the town, of which there are perhaps considerably more than were put on the map when this copy was made, with also many cases, fairly well scattered. There are about 150 cases in this epidemic.

There are certain anomalous features. For instance, a milkman who had typhoid,—I don't know for how long—distributing milk regularly from his cart, remained at his post until he went to the hospital to be operated on for a perforating ulcer. As far as we know, no cases suffered on his route, as it was carried on by the successor. The driver of a milk team went to the hospital with typhoid and admitted, as I suppose they all do, that when he was thirsty he drank milk from any broken can, and we have been unable to trace any new cases to that particular case. One more instance. During the latter part of the epidemic a case occurred in the family of a vegetable peddler on the hill, on whose grounds there was a vault, and the air of the house of that family was certainly the densest, thickest air, if it could be called air, of any house to which I have had access. We followed him up very carefully afterward, and we have been unable to learn of any typhoid on his route. So that it is plain that anomalous conditions may prevail, contrary to what we would expect.

In regard to the water supply, I will say just one more word. During the summer months, when the large reservoir is not used, we have, as the doctor said, the pond water and the Jabish Brook water, which is furnished the town directly, with slight storage. It is true, as far as I know, that there has been very little typhoid in Ludlow. I presume there has been some in people that have had access to the water. There have been three or four developed cases in Indian Orchard, which is near the source of supply of Jabish Brook. In seeking for the cause for the epidemic, outside of many cases of contact by flies, which it seemed perfectly possible and probable that there were, the explanation that was given did not seem quite satisfactory to many of us living in Springfield as to the cause of what you might almost call our annual typhoid. We have had the same disease in the same places summers; have had the same or similar peddlers and class of population in that district. We suppose that Holyoke, Lawrence and Lynn, and other cities must have similar localities. Possibly all of our typhoid, or a large portion of it, in previous years has been caused along these lines, but, as I say, as to the cause of the most of the epidemic it seemed to us that the question of water could not be entirely eliminated.

We then looked back over the last seven years, of which we have the reported cases month by month, and on this upper chart, which I don't think you will be able to see at a distance, are two lines. The broken line, the lower line, represents the reported cases of typhoid month by month, beginning with 1899, 1900, 1901, 1902, 1903, 1904 and the present year. The upper line represents the rainfall at Ludlow. The upper line is made in two colors, black (representing our best water) and in places red (brook or pond water). We feel that our water supply, aside from the Ludlow reservoir, is at least capable of pollution, and we know that conditions have existed and do exist showing that pollution does take place. We do not know of any case of typhoid on the water shed this year; I am not attempting to say that we do. We simply know that the water which we get from Jabish Brook and from the ponds is to a certain extent polluted.

Now, the only point to which I wish to refer is, that in the summer months, and occasionally in the winter with the heavy rains, our recurring typhoid is coincident with the use of the more polluted unstored water. The brook ran into the lower part of the reservoir all the year round up to 1904. Since then it has been turned into the upper end of the reservoir during the winter, and we have had more storage water. But the point is that in 1899, for instance, when the reservoir was empty, the source of supply was the auxiliary sources, and we had typhoid more or less throughout the year. During the next few months there was practically none, in spite of the heavy rainfall. With the poorer water, our typhoid goes up. In December of 1901, and January, 1902, was an increase in typhoid, after very heavy rains and warm periods in November. It seemed to us that, looking at the matter in a comprehensive way, in the main the cause of so much typhoid in Springfield can be very largely laid to the character of our water supply.

THE PRESIDENT: Professor Sedgwick, you are familiar with this part of the Commonwealth. Cannot you say something to us?

PROFESSOR SEDGWICK: Mr. President, Fellow-Members: It does seem as if Springfield had been selected from among all the cities of the State to teach us a lot about typhoid fever, water supply and municipal administration. Here is one of the proudest cities of our State, one of which the State is most proud, and yet, beginning with 1892, we had a lamentable epidemic of typhoid fever, and since that time there have been at least two more, the last one of which has been very interestingly and ably described by the two speakers who have preceded me.

It seems to me that any one looking at this map attentively would at first agree pretty thoroughly with Dr. Emerson. He would say that this is not a very different map from one which might be made almost any year of almost any city. That is to say, there is annually in all our cities a considerable amount of typhoid fever. I might go further and say there is a disgracefully large amount in all of our cities, as compared with the amounts, for example, in Germany and countries where greater pains are taken with all sanitary matters than we have yet been able to take. Certainly that is the character of the map, but it must be borne in mind that this map covers only a limited period. This is not the map of the year; it is a map of only a small part of the year, and it is obviously, therefore, the map of an *epidemic*, not of the total typhoid for a year.

Anyone who remembers the milk epidemic of 1892 will note at once the fact that this one is almost reversed in comparison with that. At that time the cases were all, or nearly all, in the McKnight district. There was one little centre down below in the same neighborhood as the present outbreak, but it proved that the man who had been delivering milk up there, when he got scared and was likely to be found out, began delivering it here, with the result that a crop of cases afterward turned up below, also. It was a notable fact in that epidemic that what you might call the poorer part of the city, the less sanitary part of the city, the filthier part, was the freer from typhoid fever. In this case it is just the other way.

I think we want to remember that in all typhoid conditions, in America at any rate, there is a considerable amount per annum which we may call residual typhoid. After a city has put in excellent water supply, an unimpeachable water supply, there is still an amount left annually—a small amount comparatively—which Professor Winslow and I called some years ago, and I think it is a good term, the residual typhoid; that is to say, it is the typhoid which is sporadic and not to be readily accounted for. We don't believe that it is spontaneously generated or anything of that kind, but it does not connect obviously with milk, or water, or oysters, or anything else.

Of course, we must in this epidemic, as in all, freely grant that some of the cases belong to the residual type, and where they have come from it is not always easy to say. It may be from the small, but continuing, pollution of a water supply, especially if it is a surface water supply, as was true in the present case at least a part of the time. But after we have made that allowance, which I take it is essentially what Dr. Emerson wishes to have made, and especially after we have added to that allowance our present contention, that a surface water, with slight storage—or even with long storage, unless it is under very favorable conditions,—is still subject to pollution, and may be the vehicle of typhoid fever, I say when we have made that allowance and added that belief, which is the belief that epidemiologists, I believe, everywhere hold today, there still remains in this case a genuine epidemic, an excess over the ordinary, which is very well shown upon Dr. Emerson's chart for 1905, where, departing from the average of previous years, the line has gone away up above the ordinary.

We may grant cheerfully that some of the lower part of this line, corresponding to the similar line of previous years, may have come, very likely did come, from the unpurified surface water delivered from Jabish Brook, although against that we must always remember the absence of typhoid fever in Ludlow and Indian Orchard, supplied from the same source. Those populations, however, are small, compared to that of Springfield, and it is quite possible that there may be a few cases in Springfield without the occurrence of any in those places, granting an occasional small pollution, and possibly a continuing small pollution, of Jabish Brook. There still remains over, however, the main excess, so well shown in Dr. Emerson's chart for 1905, and especially clear when one considers that this excess covers so small a portion of the year.

It seems to me that Dr. Magrath is right in calling this an epidemic. There can be no question about that. Now, an epidemic is an excess above the ordinary; at least, it is so understood in our common language. In some places the ordinary is an epidemic, and should be so considered, but in epidemiological work we have to talk of an epidemic as an excess above the ordinary. It seems to me that Dr. Emerson has well demonstrated that excess upon his chart, and that it is obvious to any one who is familiar with typhoid epidemics on looking at the chart.

Next, of course, comes the question, What is the cause of the excess? It seems to me that here Dr. Magrath is perfectly justified in his conclusion, namely, that this epidemic, this excess, did not come from the water, because if it had so come, it is to me inconceivable how Ludlow and Indian Orchard should have escaped, as they did escape, while using the same supply. So far as circumstantial evidence goes, and that is all we have in these cases, it seems to me that the case is proved. The excess, the epidemic, must have been due to something other than water. And there is no evidence that it was due to milk. There is good evidence, on the other hand, that it was due to filth, filthy habits, secondary, tertiary and other cases, "contact" cases, if you will—in other words, the spread of the disease by contagion and filth.

One of the most interesting things about this map is that it falls in with those maps of residual typhoid which we have for cities having good water supplies. It is the same kind of a map, the same kind of a plotting, that I have made repeatedly for cities having good water supplies, but having a residual typhoid, as they always do have; and we know that their residual typhoid is in most cases due to filthy living and to secondary and tertiary cases. What makes the case still clearer to my mind as an epidemiologist is the incidence of dates. The first thing to do in investigating any epidemic is to get the dates of attack. I take it that the other chart indicates the dates of attack, and if that is so, it bears on its face good proof that this epidemic is not a general blow from a sudden or extensive pollution of the water supply, but a slow thing, growing and getting worse as time goes on. It parallels the season admirably. It bears, as we should say, all the ear marks of a secondary infection or contact or filth epidemic, in which the filthy habits of the people are responsible for the spread of the disease.

Putting everything together, it seems to me that this is one of the most instructive outbreaks that we have ever had brought before our Association, and I consider it fortunate that a difference of opinion has enabled us to look at it carefully and see some truth on both sides. I believe that very likely some of the cases may have come from unpurified water, but that the great excess, the epidemic proper, cannot have been due to water, but must have been due to some slow, insidious spread of the disease, which went on with the season. Of course, hand to hand and finger to finger and mouth to mouth spreading is one way in which that can be done. Flies constitute an added vehicle; but I think we want to be careful and not to fix upon flies any more than we must, because it is so easy to fall back upon flies when we cannot find anything else. The flies were probably just as abundant in some other part of the city, or nearly as abundant, as they were here, for there must have been, and were, no doubt, some parts of the city where they did not have screens, and where the flies were just as abundant. I am willing to make all possible allowance for the flies, but there still remains the fact that these people living in filth, and having filth upon their tables, filth upon their food, filth upon the vegetables which they were vending, and filth around the milk cans, filth everywhere, could easily have spread the fever by filth alone. The experience which I had in Bondsville in 1892 was of this same type. In that case I attributed it very largely to the filthy handling of food and to the playing of children in filthy gutters, which had been infected from houses having typhoid cases in them.

I think another thing stands out clearly. If I understood Dr. Magrath, there were still a lot of open vaults in Springfield. Everybody who remembers Pettinkofer and the history of Munich remembers the wonderful improvement which came in in typhoid fever when Munich introduced sewerage—before it had introduced water supply at all, and while the people were still using wells; the moment the city put in sewers and got rid of the vaults, typhoid fever fell off enormously. When good water was put in it fell off still further. Vaults are nothing but filth traps. Of course, flies have access to vaults, and as we know (that is one of the things that we have learned in the last few years), flies from vaults can serve as an added element in the carrying of the disease.

In conclusion, then, I should simply say that from my own point of view, and looking back upon Springfield with great interest, since I always do look back upon it as a seat of instruction in typhoid epidemics and a laboratory, as it were, in which Massachusetts Boards of Health might observe and learn, it does seem to me that this last epidemic is one which was most needed today to teach us those factors of the causation of typhoid fever, which are relatively more important than they were in New England. Our water supplies are getting into fairly good condition; some of them are still bad, and we must not let up on the water supplies. But, having got these into better condition, our failures in other directions, the defective civilization which we still have, the open vaults, the dirty people, the flies and all such things, rise up and become conspicuous; and I don't know of any epidemic better than this one, so splendidly worked up by Dr. Magrath, to teach us the newer and much-needed lesson, that typhoid fever is not always spread by water.

(Adjourned.)

MUNICIPAL SANITATION.

By Charles V. Chapin, M. D.

Superintendent of Health, Providence, R. I.

FLIES AND DISEASE.—The role played by the house fly in the transmission of typhoid fever and other diseases has of late attracted much attention, and although there is little direct evidence that this is a common mode of transmission, and though there is some evidence that it is not, yet it is the fashion to lay the blame on this insect and make war upon it. Some communities have even gone so far as to legislate against the fly; thus Asbury Park has enacted the following ordinance:

Section 1. Be it ordained by the Board of Health of the city of Asbury Park, N. J., that in addition to the nuisances already defined in the ordinance to which this ordinance is a supplement, the construction, maintenance, use or continuance of any privy vault, or other receptacle in or upon the ground for human excrement in such a manner that the filthy contents thereof shall be accessible to flies, shall constitute and is hereby declared to be a nuisance; and the construction, maintenance, use or continuance thereof is hereby prohibited.

Section 2. Any person or corporation violating the provisions of this ordinance shall, on conviction, forfeit and pay a penalty of $25.

In Philadelphia a resolution was recently adopted to prevent flies having access to articles of food offered for sale. It was as follows:

Resolved, That the chiefs of the divisions of nuisances, milk and meat and cattle inspectors are hereby instructed to visit all retail dealers exposing for sale in front of their properties meats, fish, vegetables, fruits, candies and cake, and to instruct the proprietors that a covering of some suitable material must be provided to protect the goods so exposed from flies and insects generally.

SANITARY ENGINEERING NOTES.

By Robert Spurr Weston, Assoc. M. Am. Soc. C. E.

*NEW WATER SUPPLY FOR NEW YORK.

This report describes plans and sources for the extension of New York's water supply,—a work that has occupied the attention of many leading engineers during the past ten years. The present Croton supply can be depended upon for only about 300,000,000 gallons per diem; and it must be supplemented by a great reservoir at Ashokam, in the Catskills, where, when other contemplated reservoirs are completed, a yield of 660,000,000 gallons per diem may be obtained.

It is proposed to develop about 250,000,000 gallons daily immediately, and to build a conduit capable of conveying the whole yield of the combined water sheds whenever they are developed. Filters having a capacity of 500,000,000 gallons per diem are to be located at Scarsdale. The water will be led across the Hudson, and a large distributing reservoir will be built at Hill View. This additional supply will ultimately be connected with Brooklyn, but during the eight years of construction it is recommended that Brooklyn should develop the Long Island ground water supply, utilizing the tracts to

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*Report of J. Waldo Smith, Chief Engineer, to Board of Water Supply, 1905.

the eastward of the present sources. Staten Island, which has little or no resources of its own, will have to be supplied from Brooklyn, there being the legal barrier in the way of securing water from New Jersey—the most ready source from an engineering and economical standpoint.

Owing to the rapid growth of the city, there is urgent need for rapid progress and a large force of engineers is being drafted as rapidly as possible. Brooklyn has experienced an almost unprecedented shortage during the present year, and the same will be true in New York should the construction be delayed. There are many who fear that under the most favorable conditions there will be a shortage before the works can be put into service.

It will cost about $112,000,000 to supply the first 250,000,000 gallons per diem, and to develop the Catskill resources in full (500,000,000 gallons per diem) will require an additional expenditure of about $50,000,000.

*MANILA—NEW WATER SUPPLY AND SEWERAGE.—Contracts have been let in Manila for a new water supply, consisting of a dam, ten and one-half miles of steel pipe conduit; also a distribution system. Contracts have also been let for 51 1-2 miles of sewers.

†EDINBURGH—WATER SUPPLY.—By the completion of the New Talla Works, Edinburgh has increased her water supply by 24,000,000 gallons per diem. The works are 35 miles from the city, and consist of reservoir and filters. It is interesting to note that although the city owns over nine-tenths of the catchment basin (6,180 acres), filters were thought necessary, although within this catchment area there are only 440 acres of peat land and no surface drainage of any sanitary importance.

‡NEW MECHANICAL FILTER PLANTS.—Since the putting into operation of the mechanical filter plant at Watertown, N. Y., several important plants have been installed.

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*Eng News, 54. 1900, 377.

†Eng. Record, 52, 1905, 393.

‡Eng. Record and Eng. News, 1905.

At Youngstown, O., a plant having a capacity of 10,000,000 gallons per diem has just been put into service. This plant will purify the water of the Mahoning river, much polluted with sewage. The filters are similar to those at Little Falls, N. J., and consist of 12 units, a coagulating basin, machine house and laboratory, all built of concrete and masonry. The coagulating basin provides for about three hours' storage. The whole work cost $123,000.

The new mechanical filter plant at Danville, Va., was tested quite recently by Dr. Levy of Richmond with excellent results. The bacteria ranged from 8,250 in the unfiltered and 4 in the filtered water to 550 and 2, respectively, the average being 3,600 in the unfiltered and 2 in the filtered water, respectively. The amount of coagulant used during the test averaged 1.5 grains per gallon. The guarantees of 98 per cent. reduction when the numbers of bacteria in the unfiltered water were over 3,000 and less than 100 bacteria in the effluent when the numbers were under 3,000, were largely exceeded. The plant was built by the Pittsburg Filter Company.

At Hackensack, N. J., there has just been put into operation a new filter plant of the same type as that installed at Youngstown, O. This plant is of the most modern construction, and, like the others, it is built largely of concrete. Some new and interesting features have been introduced into the design of the strainer system, and the controllers which are attached to each filter are especially well designed.

Besides the above mentioned, smaller filter plants have been installed at Winchester, Ky.; Paris, Ky., and several other localities.

In addition to the above, plans are being prepared for a 20-million gallon filter plant at Toledo, O. This plant will also be built according to modern ideas and will cost about $800,000. It is hoped to supply the city with filtered water during 1907.

With the introduction of so many filter plants whose success is dependent fully as much upon the care with which they are operated as upon the design of the plants themselves, there come warnings from many sources against the careless and unscientific operation of these plants and the necessity for exercising supervision over many of the so-called automatic devices. For example, the reviewer has lately inspected a mechanical filter plant which has been in operation for over ten years and which is so constructed that no definite information regarding the flow of water through the filter or the amount of coagulant applied to the water can be obtained. It is unnecessary to add that this plant was not operating in a satisfactory manner.

WASHINGTON, D. C.—It is reported that the new sand filters at Washington are being gradually put into operation. Filtered water will be very welcome in Washington, as the city has suffered another typhoid epidemic during the past fall, an epidemic attributed to the water supply.

*REFUSE DESTRUCTORS.—Sacramento, Cal., and Westmount, a suburb of Montreal, are about to install refuse destructors of the Meldrum type. These destructors are typically English and their operation under American conditions will be watched with interest. The plant at Sacramento has a nominal capacity of 40 tons of refuse daily; that at Montreal 50 tons.

PROGRESS IN SEWAGE DISPOSAL.—As the result of careful and scientific experiments conducted at Columbus by Mr. George A. Johnson, contracts will soon be let for a plant to dispose of the sewage of the whole city, which will consist of settling basings, filters and effluent tanks. On account of the absence of suitable sand nearer Lake Erie, intermittent filters of the type used in New England were almost prohibited on account of their excessive cost. The process decided upon is as follows: The sewage, settled for a few hours to remove the grosser suspended matter, will be applied to trickling filters composed of coarse broken stone, at a rate of 2,000,000 gallons per

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*Eng. News, 54, 1900, 337.

acre per diem. The non-putrescible effluent from these filters will then be stored in a basin to remove the suspended matter; it can then be discharged into the Scioto River without offense.

Trickling filters will be a novelty in this country, though not so in England. Their chief advantage consists in the high rate of filtration possible with them,—about twenty times as fast as that used with the sand beds. Of course, the effluent is not so good as that from the well-operated sand filter, but it is non-putrescible, and if necessary can be further purified very easily by filtration through sand at a high rate. There are many small streams in the country not used for water supply which are extremely offensive because of the small dilution of the sewage discharged into them. The treatment of the sewage by septic tanks, trickling filters and subsiding basins, as proposed at Columbus, offers a most promising solution of the difficulties associated with such conditions.

*STANDARDIZATION OF PLUMBING FIXTURES. —The antiquated British Plumbing Regulations prepared many years ago by the Local Government Board are to be revised by a committee representing British architects, engineers, waterworks managers and plumbers. In England it is thought best to depend upon standard fittings and frequent inspection to prevent waste of water and to insure proper tightness of drains. In the United States the general opinion is that waste of water can be prevented better by the use of meters, while the plumbing regulations in many cities have been framed for the benefit of plumbers rather than in the interests of public health and convenience. Some American cities, for example, prohibit constructions which are absolutely insisted upon in others. In the reviewer's opinion it would be much better to insist upon principles being adhered to, rather than that certain standard fixtures be used, as it would be better to place the burden for the design and maintenance of the fixtures upon the householder, his archi-

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*Eng. Record, 52, 1905, 466.

tect or his plumber, than to leave it to some commission composed largely of contractors and plumbers, whose decision is too often apt to impose unnecessary hardship upon the householder.

LABORATORY NOTES.

By Frederic P. Gorham.

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Providence Health Department.

STANDARD METHODS.—Since the appearance of the last number of this journal the Report of the Committee on Standard Methods of Water Analysis of the American Public Health Association has appeared.* This report deserves the careful attention of all who have to do with the sanitary study of water whether from the chemical or bacteriological standpoint. Since the appearance of the first report of this Committee in 1897 the standard methods then proposed have been submitted to the most careful tests by all the principal laboratories of this country. It can safely be said that the present revision of this report, which has resulted from this careful testing of the proposed methods, is as complete as any such report can ever be. It is impossible here to review or discuss any of the changes and additions which appear. It can only be said that these Standard Methods are now in a shape which warrants their adoption by all who wish their results to meet the approval of the best workers along the lines of water analysis.

It is hoped that the Preliminary Report of the Committee of the Society of American Bacteriologists, on Methods for the Identification of Bacterial Species which is intended to supplement and extend the report of the committee on methods and in no wise to conflict with it, will also receive the careful attention of working bacteriologists. After this is thoroughly tested and revised a final report will be made which will put the description of species on as secure a footing as the other report has put the methods.

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*The Journal of Infectious Diseases, 1905, Supplement No. 1, Page 1.

With the general adoption of these two reports and the standard methods which they involve, bacteriology in general and water analysis in particular, will be in a condition in America far ahead of the chaotic condition which still prevails in similar work in Europe.

VOGES AND PROSKAUER'S REACTION.—In a careful paper on the "Lactose-Fermenting Bacteria in Faeces," by Alfred MacConkey, M.B., D.P.H.,[†] we find some interesting data regarding Voges and Proskauer's reaction. "The caustic potash red reaction" was first mentioned by Voges and Proskauer in a paper on the "Bacteria of Haemorrhagic Septicaemia."[‡] They describe it thus (speaking of a Schweinepest bacillus isolated by Voges): "On the addition of caustic potash we observed a new and interesting color reaction. If the tube be allowed to stand for twenty-four hours and longer at room temperature, after the addition of the potash, a beautiful fluorescent color, somewhat similar to that of a dilute solution of eosin, forms in the culture fluid, particularly at the open end of the tube exposed to the air. . . . We are compelled at present to consider this new reaction as specific for the bacillus in question as none of the remaining bacteria, notwithstanding the variety of culture media used, gave it. Neither does the Bacterium coli give the reaction, so that we have here a further most valuable means of differentiation from these inhabitants of the intestine."

Durham[¶] refers to this reaction and states that it may appear within a few hours after adding the potash. Freeland Howe, Jr.,[a] in "Notes on B. coli," refers to those organisms which produce a red color in the closed arm when standing twenty-four hours after the addition of potash, and says "just what produces this red color is not known," and "if it were possible to determine the species to which a culture characterized by this color belongs, it would be of decided advantage to bacteriologists engaged in water analysis." . . . MacConkey concludes that though this reaction has been looked for in the cultures of a large number of organisms it has only appeared "in the case of the B. lactis aerogenes group and B. cloacae group, thus entirely confirming Durham's observation that it was a point of difference between the aerogenes group and the coli enteritidis and typhosus groups. It also helps to distinguish the B. pneumoniae (Friedlander) from the B. lactis aerogenes."

[†] Journal of Hygiene, 1905, V, 333.

[‡] Leitschr. f. Hygiene, 1898, XXVIII, 20.

[¶] Journal of Experimental Medicine, 1900-1901, 354.

[a] Centralbl. f. Bakt. I. Orig., 1904, XXXVI, 484.

A STANDARD METHOD FOR THE DETERMINATION OF THE ORGANIC NITROGEN IN SEWAGE BY THE KJELDAHL PROCESS.—Earle B. Phelps suggests* the adoption, as a routine procedure in the analysis of sewage and sewage effluents, of the Kjeldahl process for the determination of the total organic nitrogen. This change seems necessary because of the untrustworthy nature of the so-called albuminoid ammonia figures. As a result of his study and at the suggestion of the Committee on Standard Methods of the American Public Health Association, he outlines a standard method of procedure which it is believed will yield accurate results, and which at the same time is sufficiently rapid and simple in manipulation to permit its adoption as a routine procedure in sewage analysis.

IMPROVEMENT IN THE TECHNIC OF THE INDOL TEST.—An improvement in the technic of the indol test which McFarland and Small have worked out† is exactly the same as one already published by Grubbs and Francis.‡ It is an application of the ring test, made by adding chemically pure sulphuric acid to the culture to be tested, in the proportion of one drop to every cubic centimeter of the culture, shaking, and then allowing the solution of potassium nitrite to trickle down the side of the tube and form a layer on the heavier culture and acid. The red color of the nitroso-indol makes its appearance at the line of contact of the two fluids.

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*The Journal of Infectious Diseases, Supplement No. 1, 1905.

†The Journal of Infectious Diseases, Supplement No. 1, 1905, 325.

‡Bulletin of the Hygienic Laboratory of the U. S. Public Health aed Marine Hospital Service, 1902, No. 7, Page 3.

VETERINARY HYGIENE.

By Veranus A. Moore, M. D.
Cornell University, Ithaca, N. Y.

SERUM THERAPY IN DOMESTICATED ANIMALS. —At the eighth International Veterinary Congress held in Budapest, in September, Leclainche presented a very exhaustive paper on the subject of serum therapy in the lower animals. The data acquired from the application of methods created by Von Behring in reference to the use of serums, he summarized as follows:

1. GENERAL PRINCIPLES OF SEROTHERAPY.—The introduction into an organism of agents or substances capable of influencing the anatomical elements, particularly the phagocytes, provokes there, under certain conditions, the elaboration of substances of an immunising or resisting character, which pass into the plasmas, especially into the serum of the blood.

The immunising serums have a vigorously specific action; they are active only with regard to the species, or varieties, of microbes or chemicals, which have served in their preparation.

The variability of certain pathogenic microbe-forms, necessitates the employment of polyvalent serums, prepared from as considerable a number of families as possible.

The identification of a disease by the preventive, or curative, effects of a specific serum, is only possible with a pure infection.

The passive immunity conferred by the immunising serums establishes itself very quickly, but does not last long. These two essential characteristics point out the mode of utilizing it.

(a) The serum is, above all, preventive; it permits of intervention among the contaminated, under conditions where vaccination, properly so-called, would be inefficacious and dangerous.

(b) The rapidity of the immunisative impregnation is so great, that the serum proves frequently curative.

(c) An active immunity can sometimes be secured by the association of the serum and the virus; the process is designated by the name of sero-vaccination. It is also known as the "simultaneous" method.

2. PREVENTIVE SEROTHERAPY.—This method is absolutely without danger, either to those treated or their neighbors; but it protects for a few days only.

It is indicated under certain circumstances.

(a) To avoid temporary danger of infection (tetanus, malignant oedema, etc.); to protect subjects exposed temporarily, as at fairs, shows, in transports, etc.

(b) At the beginning of an epizootic, in order to circumscribe the first centres of infection (rinderpest, aphthous fever, sheep-pox), and to avoid general slaughter.

(c) To protect effectives, which it is indispensable to safeguard (work of urgent necessity, cavalry, etc.), by repeating immunisative injections at short intervals.

(d) To save the contaminated, in regions infected by an epidemic of rapid diffusion (chicken cholera, red murrain, sheep-pox, etc.).

3. SEROVACCINATION.—An injection of immunising serum mobilises the defences of the organism; a virus, hardly attenuated at all, or normal, associated therewith, confers a durable active immunity.

One may: First, innoculate successively with the virus and the serum; second, innoculate at the same time at different points with the serum and the virus; third, innoculate successively with the serum and the virus.

The utilization of each of these processes is determined by the respective powers of the serum and the virus.

Another mode of utilization consists in the injection of the mixture of serum and virus. It necessitates the employment of serums obtained pure, without the addition of antiseptics, such as are prepared in France. This method secures an evident simplification of work. The mixture is made at the moment of use, and a single injection suffices.

Serovaccination is already applied in cases of rinderpest, red murrain anthrax, sheep-pox, etc. It lends itself to the most diverse combinations and adapts itself to every exigency.

4. CURATIVE SEROTHERAPY.—This constitutes the true "specific medication."

The curative power of the serum varies, according to the activity of the toxins elaborated, the rapidity of their resorption and the stability of the combinations formed.

In tetanus the serum can neutralize the circulating toxin; it is powerless with regard to the toxin fixed upon the nerve-cell.

In a general way, the serums are active during the first phases of the microbic invasion; the sooner the treatment intervenes, the more certain and more complete the cure.

The effects are only evident in pure infections; the complications of secondary infections would demand the employment of serotherapies corresponding.

The magnificent results obtained in treatment of diphtheria and red murrain permit the anticipation of an indefinitely extended application of serotherapic methods.

PROPHYLAXIS OF TUBERCULOSIS IN CATTLE.—At the same Congress, de Jong presented an instructive paper on the prophylaxis of tuberculosis of cattle. His conclusions are as follows:

1. The prophylaxis of tuberculosis among domesticated animals is desirable, not only from the point of view of agriculture, but from that of public health.

2. It should be effected, as much as possible, by the State; and this applies especially to cattle tuberculosis.

3. State prophylaxis requires first of all, compulsory notification of dangerously-diseased cattle, their slaughter as soon as possible, with compensation paid to their owners.

4. As far as possible, the State should lay down regulations for avoiding the milk danger.

5. Agriculturists should be taught the means of combating tuberculosis, they should be stimulated to take other measures for extirpating cattle tuberculosis; they should, that is to say, take care to breed healthy young stock, to guard against contagion from purchased animals, to stable their stock in roomy, well-ventilated stalls, etc.

6. It is desirable that the efforts of agriculturists to extirpate bovine tuberculosis should be aided, under certain circumstances, by the State.

7. Tuberculin is an excellent means of detecting the presence of tuberculosis among cattle.

8. The prophylaxis of swine-tuberculosis stands in no present need of special State measures, unless it be possible to apply those for combating the milk danger. In certain cases it should still be left in the hands of agriculturists, with or without State aid.

9. The prophylaxis of poultry tuberculosis may be left to private initiative.

10. The researches concerning von Behring's protective inoculation should in any case be continued.

CANADIAN NOTES.

By John A. Amyot, M. D., Ontario Board of Health.

REGULATIONS FOR SUMMER RESORTS.—The Provincial Board of Health of Ontario, acting on the report and recommendations of two of their officers on the conditions found in the Lake districts of Ontario, frequented in the holiday seasons by people from all over America, are formulating regulations to govern the health officers of the municipalities looking after these districts. In the Muskokn lake district alone over 10,000 outsiders find a summer outing place. A great number of their houses are situated on islands, all on the lake borders. It is surprising to find what people will do if not prodded by some limb of the law. At one place visited a multi-millionaire was pumping his water supply from the lake, not more than 100 feet away from his sewer outlet, with only a boulder wall intervening. At another place, the sewer pipe and the water pipe was bound together, the sewer pipe ending in some sand at the water edge, the water pipe going out fifteen feet farther, to take in the water for the house. Privies on the water edge used to be very common, but now these are very few. The regulations to be formulated are to govern such conditions. In general, dry-earth closets are to be recommended, and garbage is to be removed at frequent and fixed intervals. Where the establishments are large and sufficient, and earth of a proper kind can be got, septic tanks with subsequent sub-surface irrigation are to be recommended, especially in the case of hotels and boarding houses. The steamboats on the lake will not be allowed to empty closets or garbage into the lake, but must cremate at fixed points. Attempt will probably be made to have special legislation passed to enable such localities to incorporate themselves so as to apply their taxes to a betterment of their hygienic conditions and not all spent on roads and public works for the neighboring townships that do practically nothing for the resorts.

POLLUTION OF A PUBLIC WATER SUPPLY.—At Brampton, Ont., one Dyer was brought before the police magistrate for violation of the Public Health Act of Ontario, in allowing his house and barn-yard refuse to drain into a ten-acre lake, which served as a source of water supply to the town. He was fined $1.00 and had to pay costs, and was ordered to abate the nuisance, though it had existed before the town took the water and has continued since, a matter of some twenty-five years.

TORONTO HOSPITAL. — The subscriptions towards the erection of a new general hospital in Toronto have come up to the million-dollar mark, with all imdications that it will reach a million and a half very soon.

WARDS IN GENERAL HOSPITALS FOR THE INCIPIENT INSANE.—Following on the recommendations made to the Provincial Secretary by the Convened Asylum Superintendents, the Toronto General Hospital has put aside one of its wings for the reception of the incipient insane, where they can get treatment without the formulary required and the publicity consequent on an application for admittance to the ordinary Asylum for the Insane. Many cases, it is thought, will be saved a lifetime of insanity by an early and non-stigmatizing treatment, such as could be given in a hospital.

MINISTER OF HEALTH IN THE DOMINION HOUSE.—A new committee of six, with Dr. Lachapelle of Montreal as chairman, has been appointed to advance this idea, and see if they cannot retrieve the ground lost last year. The Cabinet look on the proposal rather favorably. The hopes are that they can be induced to put their approval into actuality.

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THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH was organized in Boston, March, 1890, *with the following objects; The advancement of sanitary science; the promotion of better organization and co-operation among local boards of health, and the uniform enforcement of sanitary laws and regulations*

THE JOURNAL OF THIS ASSOCIATION has for fifteen years faithfully reflected the views of the public hygienists of Massachusetts. With the November issue of the year 1904, *the encouragement received from many hygienic quarters induced the Association to undertake the expansion of the Journal to a national standard, with the co-operation of many noted sanitarians as editors. A new title was selected, while the older and well-established title was retained also.*

The dates of publication are FEBRUARY, MAY, AUGUST *and* NOVEMBER *of each year.*

THE JOURNAL will contain the papers read at the meetings of the Association, papers contributed by hygienists, reports of the discussions, editorials, abstracts, reviews and hygienic notes of professional interest. Subscription rates, $1.00 *per year. Reprints furnished at cost price.*

All communications concerning the JOURNAL, copy, proof, subscriptions, advertisements, etc., should be addressed to the Managing Editor, DR. H. W. HILL, 739 *BOYLSTON ST., BOSTON, MASS.*

All communications concerning the ASSOCIATION should be addressed ta the Secretary of the Association, JAMES C. COFFEY CITY HALL, WORCESTER, MASS.

All bills not relating to the Journal, and MEMBERSHIP DUES ($2.00 *per year), should be sent to the Treasurer of the Association DR. JAMES B. FIELD,* 329 *WESTFORD ST., LOWELL, MASS.*

EDITORIALS.

EXECUTIVE SANITARIANS AS SPECIALISTS.

Sanitarians represent an important group of men who are dealing with special problems. As workers, they may be divided into executive, constructive and laboratory sanitarians. Medical men make up a large proportion of the executive sanitarians; engineers a large proportion of the constructive sanitarians. In the laboratories are found men —medical and non-medical—well trained along various scientific lines bearing upon sanitary problems. Some of these continue indefinitely in routine or research laboratory work. Others drift after a time into the executive or the constructive lines of work.

Sanitary problems, as viewed at the present time, are largely of recent origin, belonging to the bacteriological era which is not yet half a century old.

In 1872 the American Public Health Association was organized, and in 1898 it enlarged its field of usefulness by creating a Laboratory Section. In 1885 the Conference of State and Provincial Boards of Health was organized. In 1902 the functions of the United States Marine Hospital Service, which had been enlarged from time to time during the previous century, was still further extended, making of it a National Public Health Service. These organizations all have a national or international standing of a strictly sanitary nature.

In addition to the above, there are various technical organizations which must in the very nature of things deal with sanitary problems. These include the Societies of Engineers, Bacteriologists, Entomologists, Chemists, etc. All of these, so far as sanitary work is concerned, should have some common meeting ground. It is even a question if they should not all be parts of one great sanitary organization. At present scientific men are hampered in their sanitary work because of lack of opportunity to compare notes with others working along somewhat similar lines or because they have no opportunity to put to the test, through executive departments, the practical operation of their methods.

If sanitarians are to keep in the front rank they must have able executives as their leaders, in order that the practical scientific work along sanitary lines may be fully developed. What are the actual conditions? There are but few States that are thoroughly organized in sanitary work, and only a few of these give sufficient financial compensation to their executive officers to furnish them a creditable living. Still further, most of the appointments for the executive officers are purely political, and there is no inducement for capable medical men to give up lucrative and pleasant professional work for a temporary political position as a sanitary expert. The same is true of cities. It would seem that in the larger of these, men of ability could and should be secured as permanent officials in such important sanitary work. Yet in the twenty-five largest cities of the United States I venture to say that there are not five sanitary executives who give their entire time to their department, and none who are free from political supervision.

This is a day of specialization. Specialization is necessary if the best results are to be obtained. Encouragement should be given to medical men to specialize in sanitary work, for preventive medicine is of greater importance to the people at large than is curative medicine. No such encouragement exists at the present time. The medical man who chooses to take up a special line of work should feel that he is making an upward step in his professional life. The medical man who is bold enough to step out of general professional work into the position of a sanitary executive—State or municipal—is, as a rule, placing himself in the hands of politicians, who rarely appreciate the importance of the responsibilities resting upon them in dealing with sanitary problems. I think it is safe to state that the official life of sanitary executives in our larger cities is rarely more than five years; and with but few exceptions, the same is true for similar State officials.

The constructive sanitarians and laboratory workers are in a better position than executive sanitarians, for, as a matter of fact, they are, to a large extent at least, free from political restraint.

It follows from the preceding statements that sanitarians cannot under present conditions keep pace with other scientific workers. The laboratory men may be strong as bacteriologists, chemists, etc.; the engineers may be leaders along their special lines; but there is no executive force to bring all these representative workers together in the solving of sanitary problems. It is time that some well-organized society was taking up this matter. The American Public Health Association is the natural body through which this work should be carried on. It has great responsibilities resting upon it. Its duties were ably outlined by Dr. Wesbrook in his presidential address before the Association at its meeting in Boston last year. The Association should, through Sections, cover all lines of sanitary work. There should be one great body, with its many important branches. A lesson might well be taken from the American Medical Association, which not only has its Sections to cover all important medical work, but is so organized throughout the nation, State and county, as to bring about the best results through the united efforts of its members. Still further, it has its Journal, which reaches all of its members.

Give thought to the great possibilities of the American Public Health Association, if organized along similar lines to those of the American Medical Association. It would then become a national organization, with representatives in every State, county, city and village; a national organization, with its Journal reaching all members, even in the remotest sections of the country; a national organization that could bring to its support all the workers having any relationship whatever to sanitary problems. Such a condition is a possibility

—not a dream. It is simply a question as to whether the American Public Health Association is ready to seize the opportunity to make itself felt as a leader in preventive medicine.

H. M. BRACKEN.

THE RELATIONS OF EXECUTIVE TO TECHNICAL MEN.

The development of laboratories in State and municipal public health work has resulted in the development of a new set of technical men engaged in official public health work, the adjustment of the positions and relations of which to the older established executive health official, has given rise at times to some misunderstanding.

The development of engines and engineers in ocean traffic presents a parallel worth considering. Before the introduction of steam, the captain had in direct charge every detail of the ship's economy—the cargo, the passengers, the sailors, the cook, the navigation; he ordered sails set or taken in as in his judgment seemed best; he and he alone was responsible throughout for everything.

On the introduction of steam, the captain continued to be the executive head, the director of everything, but he could not be absolute in the technicalities of the new department. The engineer is a steam specialist, and the captain, generally, is not. Few men can learn the multifarious and important duties of the captain of a large modern steamer, and at the same time secure the adequate special training of a well-qualified engineer. No man, even if he succeeded in securing adequate training in both lines, could thereafter supply in practice the energy or time under modern high pressure conditions, to properly conduct both, at least in large boats. Hence, perforce, the engineer is independent, but only in his own sphere. He need not know and does not dictate the type of engine, the kind or amount of oil, the particular variety of coal, or the method of firing. The captain is responsible for the sum total results of the voyage achieved; he is fully within his absolute rights in using the engine power to achieve those results—it is for this that the engines and engineers exist—but the engineer, alone and untrammeled, must develop that power for him, must advise him as to its most economical and efficient use, and may refuse to do what, from his technical standpoint, is impossible or injurious.

In seafaring lines these distinctions between executive and technical are sharply drawn and clear cut. Where both captain and engineer are intelligent, broad-minded and genial, the most harmonious relationships may exist and each may suggest or ask advice without sacrificing for a moment his or the other man's basic rights or independence. Even where these harmonious personal relations do not exist, the official relationships remain clearly defined.

But in public health circles the relationship between executive and technical men, strictly analagous to that of a captain and engineer though they be, are not yet so clearly established. The executive health officer of thirty years ago conducted his health department along established lines. Now specialism has developed in all lines of life and in public health circles just as much as in any other. The technical man has come to furnish the executive health officer with principles of action, and actual power in diagnosis and analysis, such as was undreamed of in the older days. The executive remains and must always remain the responsible officer, the many-sided man of multifarious duties. He must as always direct the application of all the power he can command to this or that object, this or that course. But he can no longer direct the minutiae of the technique of developing or applying that power, even while it is entirely for him to say to what the developed power shall be applied. Of course, as with the captain, he cannot ask impossibilities, and the technical man can often point out how the application of the power to a special object is wasteful or inadequate as well as the converse.

The ideal relations, then, of the executive man to the technical man in public health work must be based first of all upon a due recognition by each of the exact official sphere and responsibilities of the other. Upon this should be built a broad-minded, intelligent and cordial desire on the part of each to fully understand the other man's problems and difficulties, and to supply his part at the best conditions for the most efficient, most adequate and most economical results. The maximum result from the minimum necessary expenditure of time and energy is the motto of applied science of every description.

The most common fault of which the modern health officer is accused seems to be a desire to use the laboratory for things for which it was not intended, and which it cannot do, while the chief fault of the modern technical man is to consider his work as an end and not as a means to an end.

The modern steamship line does not run in order to give employment to its engines and engineers, but to accomplish certain desired results. The modern public health department is run to reduce morbidity and mortality, not to furnish work or experimentation for the laboratory. But the modern engine and engineer exist because the times call for the most scientific knowledge applied in the most practical ways to achieve the needed results in the most adequate, efficient and economical manner. The modern technical expert exists for exactly the same purposes and reasons.

So in public health affairs, morbidity and mortality will always remain to be attacked and leaders to marshal the hygienic forces against them there must always be. Modern technical work may some day—although now there are no signs of it—be superseded by some more efficient, more direct and more searching method of achieving these ends, but until that day comes the technical man must have proper recognition on his own field of work.

CHICAGO VITAL STATISTICS.

In the Bulletin of the Health Department for January 20, 1906, the Commissioner of Health of Chicago publishes what he says is his last word in answer to those who challenge his vital statistics. One must regret that the Commissioner will not return to the subject, for the American Journal of Public Hygiene has published some critical remarks on Chicago vital statistics, and it is disappointing that the Commissioner should not have thought some of these observations worth notice. The Commissioner is most fortunate in that seven distinguished physicians have undertaken to say for him as much as he could have said for himself, if not more. The Commissioner's reserve may mean that future inquiry should be addressed to the gentlemen who have relieved him of direct responsibility on this account.

In order to forestall the criticisms and incredulity with which the vital statistics of Chicago have been met for several years past, Dr. Whalen asked the Chicago Medical Society to appoint a "committee of experts" to investigate the local registration office for the purpose of discovering defects and suggesting reforms. The president of the society appointed this committee as follows: Dr. A. C. Cotton, Dr. N. S. Davis, Dr. Adolph Gehrmann, Dr. Ludwig Hektoen, Dr. G. W. Webster, Dr. Weller Van Hook and Dr. J. Allen Patton. The date of this action is not given, but it was later than November 21, 1905. This committee, at its first meeting, appointed a sub-committee "to study in detail the collection, registration and checking of vital statistics." Drs. Gehrmann, Webster and Patton made up this sub-committee. The date of this action is not given, nor the date of the first meeting of the subcommittee, nor is the date recorded of the last meeting of the committee. Their report was unanimously adopted by the Chicago Medical Society on January 9, 1906, and that part of it which is printed in the Bulletin is the Health Department's last word in defense of its Bureau of Vital Statistics. The contents of the report, interesting as they are, do not compare for a moment with the interest of its chronology. This is astounding. It is of most urgent necessity that all the registrars in this country be informed by what means Drs. Gehrmann, Webster and Patton were enabled to complete in six weeks a task which would occupy all the time of an average registrar and three clerks for six months. The published information concerning the methods employed by the Bureau of Vital Statistics of Chicago might have seemed comparatively unimportant, if the committee had at the same time explained the almost incredible speed of their investigation. The explanation of this unique performance may lie in some simple device whose originator does not know that it is original, or of particular value. By all means let us have the explanation. The secret of such marvellous facility is a thing to be desired above rubies, a cause of importunate yearning, an object of supplication and prayer.

The committee publishes eight reasons for believing "that the Health Department is obtaining reports of and recording all the deaths that occur in the city of Chicago, and is making accurate use of the same in the compilation of Vital Statistics":

"1. No permit for the burial or shipment of a body can be obtained in the absence of a certificate of death properly signed by a physician.

"2. Certificates of 'Unknown Cause' of death are invariably referred to the Coroner for his certificate as to the cause of death.

"3. Bodies found in the lake or waters adjacent to the city, or of persons dying on trains, boats, etc., which are brought into the city are recorded by the Department in the city's mortality, regardless of the place of death.

"4. Deaths occurring at Cook County institutions, even though outside of the city, as the Dunning Asylum, Tuberculosis Hospital and the Infirmary, of all persons that were sent there from Chicago are included in the city's mortality.

"5. Registration of deaths now includes all deceased infants that have breathed, but prior to November 1, 1905, infants surviving less than twenty-four hours were classed as still-births.

"6. It is the committee's opinion that no body can be disposed of in the city of Chicago, by burial, cremation or by shipment in a public conveyance without being recorded by the Health Department. (a) Bodies used for dissection are receipted for by the Demonstrators' Association and recorded by the Department as having been buried in a certain Medical College, based on a certificate returned by the college clerk. (b) Cemetery clerk's records of burials are checked monthly, and must agree with the Department records, thus preventing surreptitious interments. (c) Railways or other methods of public transportation will not accept a body for shipment without the Department certificate. Shipment of a body surreptitiously by rail or boat would require the connivance of the undertaker, shipping agent, baggage or expressman, receiving agent and undertaker.

"7. The death rate of the city of Chicago is based on the United States Census Bureau enumeration of the population for 1900, with the Census Bureau estimate of annual increase, which is 0.1 of the increase between the census enumerations of 1890 and 1900. This method gives a population for 1905 of 1,990,750, the estimated annual increase being 59,872. These figures in the opinion of the committee give too low an estimate, though probably more accurate than the larger estimates of the School Census or the City Directory.

"8. The records of the Department's investigation of the discrepancies between the United States Census Bureau returns for 1900 and those of the City Health Department clearly demonstrate to the satisfaction of the committee the greater accuracy of the Health Department figures, because of the fact that the Health Department's figures were based on official facts (death certificates), while the Census Bureau's figures were based on inquiries."

The third and fourth of these "reasons" furnish surprising information, which is more briefly stated by the Commissioner, thus: "The Chicago Medical Society states unequivocally and unanimously that not only are all deaths occurring in Chicago recorded by the Bureau of Vital Statistics, but *many others, usually excluded*, are also added to the total upon which Chicago's mortality rate is computed." Registrars have often wondered why Chicago never prints any separate statement of deaths of non-residents, but no one expected to be told that Chicago charges these deaths against the city. Chicago is a great medical centre. Her hospitals include a very considerable population of transients, many of whom die in Chicago. Other cities do not charge such deaths in their mortality accounts, but state them separately, so that every-one may see the difference between the gross mortality actually recorded in the city, and the net mortality on which the death rate is based. Chicago frequently publishes comparative death rates, and the essence of such statements is supposed to lie in the comparability of the data. But it seems that the data of New York, for instance, are not comparable with the data of Chicago; that the Commissioner knows that the figures are not comparable; and that the Committee does not advise the easy correction which would give them at least partial comparability. What is most remarkable, the dissimilarity of mortuary data is unjust to Chicago, causing her death rate to appear higher than it really is; and this amiable prevarication, hitherto carefully guarded from publicity, is only now confessed because some unknown critic has charged Chicago with figuring a low death rate by the vulgar method of inflating her population.

If the Commissioner of Health will not reconsider his resolution of silence in future, many important inquiries about the elements of Chicago's numerical statements will have to remain unanswered. Perhaps the unpublished records of the Medical Society will afford information on certain points not covered by the published report. If the Society is not resolved to be as uncommunicative as the Commissioner, answers to the following queries would be appreciated by the readers of the American Journal of Public Hygiene.

1. Have the published death rates of Chicago in the past five years taken into account precisely the same number of deaths, and the same deaths, accounted for in all the mortuary records of the Department made during the same period?

2. Does the fact that all certificates, alleging "unknown" causes of death, are referred to the coroners, explain the fact

that in the vital statistics for five years, including 130,219 deaths, not one death was charged to "Unknown Causes" (No. 179 of the Classification)?

3. Besides deciding that the Health Department's mortuary records are more reliable than those obtained by the enumerators of the Twelfth Census, did the committee also find that the records added by the Census Bureau to the mortality registered by the city represented deaths which did not occur in Chicago?

4. In the Bulletin of July 22, 1905, the Commissioner says that the death rate of Chicago in 1873 was 27.6, and the average age at death 15.3 years, while in 1904 the death rate was 13.6, and the average age at death 32.5 years. From these figures the Commissioner derives the conclusions that "In a single generation the death rate of Chicago has been reduced one-half, and the duration of life within its boundaries has increased twofold." Does the committee believe that the figures warrant the Commissioner's conclusions?

5. In the Bulletin of January 27, 1906, the Commissioner says that the average age at death in 1869 was 13.92 years, and in 1905 the average age at death was 31.83 years, and that these figures demonstrate "an increase of 138.7 per cent. in the average duration of life in this city." In the same Bulletin the Commissioner prints a table showing that the average age at death in 1875 was 16.17 years, and in 1905, 31.83 years. Over this statement he prints a small cap head, as follows: "Increasing Duration of Life in Chicago Doubled in a Single Generation." While approving the past work of the Bureau of Vital Statistics, did the committee make any reservation, or offer any admonition, concerning the future publication of such atrocious nonsense?

6. Did the committee verify the Department's statement, published in 1904, that pneumonia caused 22.32 per cent. of the total mortality, and that 21.8 per cent. of all deaths occurred in the age period under five years? If so, did they note the phenomenal disturbance that must have resulted

either in the age distribution of pneumonia, or in the seasonal distribution of infant mortality?

7. Did the committee verify the statement of the Department in 1904 that measles declined to 9-190 and whooping cough to 4-93 of its former mortality, while pneumonia rose at the same time from 16 per cent. to more than 22 per cent. of the total mortality? If so did they find any explanation of this unique and most fascinating statistical topsy-turviness?

The basis of prevailing skepticism concerning the vital statistics of Chicago consists in the illusions which the figures create in the minds of the official statisticians. It is not necessary to suppose that the statisticians deliberately succumb to these illusions. However sincere they may be, and however true the figures themselves may be, the fact that fantastic misinterpretations of the statistics are frequently published, justifies a doubt whether men who are so easily misled by figures can keep numerals in order at any stage of their work.

JOHN S. FULTON.

Baltimore, January 30, 1906.

ANNUAL MEETING

OF THE

Massachusetts Association of Boards of Health.

The annual meeting of the Massachusetts Association of Boards of Health was held at the Hotel Brunswick, Boylston street, Boston, on Wednesday, January 24, 1906. Vice-President Chapin presided.

VICE-PRESIDENT CHAPIN: Ladies and Gentlemen, if I had had any idea last year when I was elected Second Vice-President that I should be called upon to do any work, I should not have ventured to accept the honor. Unfortunately for the Association, both Dr. Durgin and Dr. Walcott are absent today, so I shall have to ask you to bear with me. The Secretary, Mr. Coffey, also is absent, so I suppose that the first business of the meeting will be to elect a Secretary pro tem.

(On motion of Dr. Field, Mr. B. R. Rickards was elected Secretary pro tem.)

VICE-PRESIDENT CHAPIN: Has the Executive Committee any business to report?

DR. FIELD: The Executive Committee nominates Dr. George B. Magrath, assistant to the Secretary of the State Board of Health, for membership.

VICE-PRESIDENT CHAPIN: You hear the report of the Executive Committee. They nominate Dr. George B. Magrath as a member of the Association. What is your pleasure?

(On motion of Dr. Palmer, and by vote of the Association, the Secretary pro tem. cast one vote for Dr. Magrath, thus electing him to membership.)

VICE-PRESIDENT CHAPIN: The next order of business is the report of the Treasurer.

DR. FIELD: Annual report for 1905.

REPORT OF THE TREASURER.

Receipts.

Balance from 1904	$1,100.59
Interest	37.21
Annual assessments	531.00
Total	$1,668.80

Expenses.

Postage	$56.60
Printing	28.85
Cigars and dinners for guests	30.45
Clerical assistance	9.75
Treasurer's bond	4.00
Report of meetings	100.55
Printing Journal, two numbers	109.13
Express	.40
Total	$339.73
Balance to 1906	1,329.07
Total	$1,668.80

Of this balance, $1,020.78 draws interest in the Central Savings Bank, Lowell.

Respectfully submitted,

JAMES B. FIELD, Treasurer.

Examined and approved as correctly cast and properly vouched for. J. ARTHUR GAGE, Auditor.

January 18, 1906.

In explanation of our large surplus, $1,329, I should say, as I have said in many years, that the prosperity of the Association depends upon the prosperity of the Journal. When the Journal is paying for itself we can accumulate a surplus

I hope that surplus will eventually get so large that our dues will only be $1 per member. But when we make a new contract for the Journal, and cannot make a good contract, it would only take the issue of about three or four numbers of the Journal to wipe the entire surplus out and put us into bankruptcy. So it is essential that we should have some surplus stored away to come and go on.

VICE-PRESIDENT CHAPIN: You hear the report of the Treasurer. What action will you take?

MR. UNDERWOOD: I move that it be accepted, and placed on file.

(The motion was seconded and adopted.)

VICE-PRESIDENT CHAPIN: The next item on the order of business is the report of the Secretary.

(Mr. Rickards, Secretary pro tem., read the records of the October, 1905, meeting of the Association.)

VICE-PRESIDENT CHAPIN: You hear the report of the Secretary. If there is no objection, it will be accepted.

The next business is the election of officers. What is your will in regard to the election of officers?

DR. HORACE E. MARION: I move that the nomination of officers for the ensuing year be made from the floor.

(The motion was seconded and adopted unanimously.)

VICE-PRESIDENT CHAPIN: Nominations for officers for the ensuing year are in order.

DR. HORACE E. MARION: Mr. President, I need not go into the history of the Association, or the good work that it has done. If I am not mistaken, our very efficient Secretary conceived the idea of having the Boards of Health of the various towns and cities joined in an association like this, and he consulted the present officers of the Association and formed this organization. Whatever of distinction the Association has made outside of the State, and whatever it has accomplished within the State, is certainly due to their most efficient and gratuitous service. At the last annual meeting the nominating committee volunteered the suggestion that the tenure of office be limited. Such a recommendation, it seems to me, was entirely out of order. It was not put before the Association at that time. Such a measure should be brought up as miscellaneous business, and discussed in the Association, and acted on. It was not so discussed, and it has not been mentioned since then. It thus puts the Association and its officers in a very unpleasant light,—the Association, because we are simply responsible for a deed that is manifestly not the wish of the Association; the officers, because they certainly would not serve if there was any dissentient feeling. You know, gentlemen, how you stand in the Association upon such a movement as this. You know, too, how much is due to the officers of our Association for what we have succeeded in accomplishing in the past. A hint such as was made by the suggestion is sufficient to queer the present officers. I hope the action of this meeting will be such as to insure the retention and re-election of the past officers of the Association. (Applause.)

MR. CARY: I heartily second the member's motion. I think our officers have brought the Association up to the standing it has today, and have done it where perhaps no other men in the State could do it. Situated where they were, with the influence that they had throughout the State and throughout the country, I think they have brought the Association up to date where it would not have been if it had not been for them. I certainly hope the Association will elect those officers by a unanimous vote.

DR. NEWCOMB: Mr. Chairman, if in order I would like to nominate Dr. Henry B. Walcott, Dr. Samuel H. Durgin, Dr. Charles V. Chapin, Dr. James B. Field and Mr. James C. Coffey to continue in the positions which they have so long and so ably filled. That is my motion.

DR. PALMER: Mr. Chairman, I have been waiting in hopes the chairman of the committee that made that suggestion, Prof. Sedgwick, would speak for the committee. I find that during the year there has been a misunderstanding as to what the recommendation of that committee a year ago was. I was the third member of that committee, and the suggestion that was made was, that in the lesser positions, it might be for the advantage of the society that a change of men be made, that different parts of the State might be represented. It had no intention of changing the heads of the Association. As I remember it, the chairman of that committee, who brought in the report, fully explained that point. Inasmuch as he is not here, I want to explain that the committee had no thought of lack of appreciation of the faithful work that has been done by these first officers, or wanted them changed. I give this simply in explanation and in correction of what I think has been a misapprehension on the part of the society as to the work of that committee at that time. I gladly second the motion.

VICE-PRESIDENT CHAPIN: Are there any other nominations? If not, I will ask the Secretary to put the question of the election of the officers as nominated.

(The motion was put by Mr. Rickards, Secretary pro tem., and the five gentlemen nominated were unanimously re-elected.)

VICE-PRESIDENT CHAPIN: It is now necessary to elect five new members of the Executive Committee, to serve for two years. What action will you take in regard to the election?

DR. WORCESTER: Mr. President, will you please read the names of the present Executive Committee?

VICE-PRESIDENT CHAPIN: G. E. Tobey, W. H. Gove, G. H. Ellis, C. V. Chapin, H. C. Emerson, F. W. Kennedy, W. C. Kite. Of course, C. V. Chapin really should be dropped from that committee, as he is Second Vice-President and *ex officio* a member of the committee. The gentlemen whose names I have just read are the ones whose term of office expires now. There are five other members, who were elected last year for two years. There are five men to be elected, then, at the present time, as members of the Executive Committee for the next two years. I shall be glad to hear nominations.

DR. NEWCOMB: Mr. Chairman, if in order I move that we appoint a nominating committee.

(The motion was seconded.)

VICE-PRESIDENT CHAPIN: It is moved and seconded that a nominating committee be appointed to suggest names for the Executive Committee for the ensuing two years.

DR. WORCESTER: I move, as an amendment, that the committee consist of three members and be appointed by the Chair.

(The motion, as thus amended, was adopted.)

VICE-PRESIDENT CHAPIN: I will appoint Dr. Worcester, Dr. Harrington and Dr. Smith.

DR. TOBEY: I would like to say to this committee that I hope they will have no hesitation in dropping my name from the Executive Committee. I have been a member of the Executive Committee continuously since the organization of this Association, and I think it is about time that I should give way to someone else.

VICE-PRESIDENT CHAPIN: Is there any other business to be brought before the Association?

A gentleman who sits beside me, who is connected with the Boston Board of Health, reminds me that it is customary at this meeting for the Chairman to suggest that invitations from Boards of Health for the April meeting are in order and would be gratefully received.

The nominating committee is ready to report.

DR. WORCESTER: Mr. President, Members of the Association:—Your committee wish to submit the following names. We found that there were five men to be nominated for two years, and that there were two men who, according to our by-laws, should be nominated, that is, two more, to fill out one year's service. There were not enough members on the Executive Committee. For two years we would nominate Dr. Walcott P. Bowers, of Clinton; Dr. L. M. Palmer, of Framingham; Dr. E. H. Stevens, of Cambridge; W. L. Underwood, of Belmont; Dr. G. Arthur Bodwell, of Salem. For one year, Dr. Wesley T. Lee, of Somerville, and Dr. J. T. Bullard, of New Bedford. That is the entire list.

VICE-PRESIDENT CHAPIN: Gentlemen, you hear the nominations brought in by the committee. What is your wish?

DR. HARGRAVES: I move that the report be accepted.

(The motion was seconded and adopted, and the gentlemen named were then elected members of the Executive Committee by unanimous vote.)

VICE-PRESIDENT CHAPIN: If there is no other business to be brought before the Association, we will proceed to the reading of the papers. Of course, there is no necessity for introducing the first speaker. We are all delighted to hear him. We are not only delighted to hear him, but we always go away with a decided increment to our scientific knowledge. It gives me great pleasure to present Professor Theobald Smith, who will read a paper upon "What Is the Relation Between Human and Bovine Tuberculosis, and How Does It Affect the Inmates of Public Institutions?"

WHAT IS THE RELATION BETWEEN HUMAN AND BOVINE TUBERCULOSIS, AND HOW DOES IT AFFECT INMATES OF PUBLIC INSTITUTIONS?

Dr. Theobald Smith, Harvard Medical School, Boston, Mass.

The progress made in the past twenty-five years in the study of infectious diseases, notably those of the higher domestic animals, has placed us in a somewhat different position with regard to the question of the intercommunicability of infections between animals and man. When the tubercle bacillus was discovered there was but little known of the definite limitations of microörganisms to certain hosts. Then pathogenic power toward one of the higher animals meant rather vaguely danger to all others. Now pathogenic power of any microbe toward a given animal species means that and no more until more has been proved. We may protect ourselves in actual life against possible dangers, but we have not thereby proved that these dangers are real. Unfortunately much of the anxiety we feel toward infections emanating from the lower animals cannot be placed at rest because the experimental method, the actual test, is inapplicable, and we must content ourselves with roundabout methods, clinical observations, inferences from analogy and painstaking comparisons between the microörganisms if they can be seen and cultivated.

To what extent infectious agents are restricted in their activities is shown by the fact that only one of the infectious diseases of man—the bubonic plague—is shared by one of the lower animals, the rat. The plague is known to spread freely from rat to rat, from rat to man and less freely from man to man, so that some are inclined to the view that the plague is primarily a rat disease. There are other infections which may be transmitted from animals to man, but only under exceptional circumstances. Man does not, as a rule, transmit these to his fellow-man, chiefly because the necessary machinery for transmission is absent.

After the publication of the celebrated work of Koch in 1882, it was generally conceded that bovine and human tuberculosis were absolutely identical, and that ingestion or inhalation of the bacilli from one source was as dangerous as from the other. Facing this problem of intercommunicability from the standpoint of today, the burden of proof really rests upon mals and the reverse. For we cannot but assume that two those who admit such a free transmission from man to ani- bacilli of highly parasitic character, one living in cattle and the other in man, must eventually develop irreconcilable differences stamped upon them by their respective hosts, unless such remarkable mutual affinities exist as those manifested by the plague bacillus. But these should be demonstrated rather than assumed.

It was reasoning of this kind coupled, with experimental observations that led me in 1894 to study more in detail cultures of tubercle bacilli from different hosts. This is a tedious process. It was not until 1898 that a series had been studied sufficiently large to justify the establishment of two races or types of tubercle bacilli, a bovine and a human type, although I had demonstrated in 1896 profound differences between the two types. This investigation led me to take the position that it was impossible to tell precisely how such differences in the bacilli influenced intercommunicability, and that we must now begin to study cases of human tuberculosis to determine more accurately which types of disease may be referred to animal sources.

At the same time I contended that these results contradicted the extreme fear with which bovine tuberculosis was being regarded, and that it did not justify the very heavy expenditure of public funds in the destruction of all tuberculin-reacting animals, and what was still worse—the condemnation by law of the flesh of even the mildest, most insignificant cases as unfit for human food. This position was all the more necessary, since the importance of the strictly human source of tuberculosis, the sputum, was being pushed to the background, and our State was appropriating not less than a quarter of a million dollars a year for the eradication of bovine tuberculosis.

Now it is possible that we may be threatened again by legislative schemes to pay out of the public treasury money to defray the immunization of young cattle according to von Behring's scheme. What the State can justly do is to pay for suitable experiments to study this method and to prepare the vaccine, but nothing more. If the State has any money to spare, it should be reserved for the care and housing of human consumptives.

The work of studying the tubercle bacillus along lines laid down by me was being carried on quietly, notably by Ravenel in Philadelphia. It was not, however, until 1901, when the great authority of Robert Koch placed itself directly across the path marked out by sanitarians since the publication of his great discovery in 1882. He maintained not only the radical distinction between bovine and human tuberculosis, but went so far as to regard the bovine disease as a negligible quantity in our struggle against the human disease. While he may be said to have gone too far in this latter position, his views exercised a salutary influence in forcibly drawing the attention of the world's sanitary machinery *from a minor to a major* source of disease, and without doubt the public anti-tuberculosis movements of today, of which this meeting is a part, gained an enormous impetus through his somewhat one-sided position.

The wave of opposition raised by Koch's address led to the appointment of a number of commissions to investigate the subject anew. The English Government had only a few years before issued a very large report by a royal commission in which the bovine and the human disease were regarded as identical. A new commission was formed at once, which established perhaps the most elaborate temporary plant in the world for the re-investigation of this question. A leaflet issued several years ago leads us to infer that in its final report the commission will adhere to the platform of the former commission. A royal commission appointed by the imperial health office of Germany has recently issued a series of reports in which it places itself wholly on the ground taken by me in 1898.

Many minor investigations upon this subject have been made and published during the past four years which range themselves on one side or the other of this sanitary problem.

If we briefly summarize the results of these investigations we find two facts firmly established: 1. The conception of two types of mammalian tubercle bacilli, a bovine and a human type. 2. The occasional presence of the bovine type in cases of human tuberculosis.

How often the invasion of the human subject with bovine bacilli takes place cannot be stated with any degree of accuracy for all investigators have turned their attention chiefly to cases originating in the digestive tract or its associated lymph nodes, *i. e.*, to those cases in which infection through raw milk may have taken place. We are, however, in the position to affirm that the old notion that all tuberculosis originating in the intestinal tract is of bovine origin is not true. Of five such cases studied by me, one was associated with bovine bacilli. Of twelve studied by the German commission, six were associated with bovine and one with both kinds of bacilli. Ravenel had reported several cases, similarly the Department of Agriculture at Washington. I have not at hand the means for calculating the percentage of intestinal tuberculosis associated with bovine bacilli, but it may be roughly estimated at twenty to forty per cent. This may seem a relatively high rate, but the following circumstances must be taken into consideration:

1. A certain proportion of these cases are stationary. The disease is restricted to the mesenteric lymph glands.

2. Where tubercular ulcers due to the human bacillus exist, the bovine bacillus in the milk may be admitted, when this might be impossible with an intact mucosa.

3. Tuberculosis of intestinal origin is a relatively rare affection.

4. In Japan, where milk does not play any appreciable role in the feeding of infants and children, human tuberculosis, including the intestinal disease, is as common as in other countries.

I can merely refer, in passing, to the question of the transformation of the bovine into the human bacillus in the human body. If this were possible, our efforts to trace the sources of tubercular infection by bacteriological methods would be fruitless. While I am prepared to admit a certain change manifested by reduction in virulence the evidence we possess is conflicting and hardly in favor of the transformation theory.

It is needless to state that much more work must be done before we can formulate precisely the relation which the bovine bacillus bears to tuberculosis of alimentary origin. In the meantime, certain broad facts stand out above the fog of controversy to which those to whom the health and well being of large numbers are entrusted may cling with a reasonable amount of confidence.

In the first place, the bovine bacillus has been found almost exclusively in children under ten years of age. Phthisis and the other forms of tuberculosis of adults are, so far as we know, almost wholly of human origin. Institutions in which children are cared for, the source of the milk should receive careful attention and herds belonging to the institution should be free from any traces of this disease. In institutions harboring adults there need be less anxiety on this point, and if all animals of reduced vitality or whose udders are not above suspicion are eliminated, the danger of infection may be regarded as exceedingly small. This standpoint is based upon the following well-established facts:

1. With few exceptions cattle reacting to tuberculin are in an early or latent stage of the disease during which tubercle bacilli are not excreted in the milk.

2. When tuberculosis becomes generalized, which frequently happens after parturition, and the udder and uterus become affected physical examination and microscopic examination of the secretions should detect it.

To these we may add that it is highly probable that we can successfully resist an occasional tubercle bacillus and that most of us, at one time or another, have ingested without harm a few bacilli in milk or butter. It is equally probable that our resistance may give way at an unguarded moment when our alimentary tract is being daily flooded with bacilli from a tubercular udder.

In view of these data it is obvious that a careful periodical inspection of dairy herds cannot be dispensed with and that such inspection should be made a necessary function of State and local boards of health or of specially organized bureaux in order that any advanced cases of tuberculosis may be detected, removed and destroyed. More than this cannot be demanded at present in the interest of public health. Yet it should be the pride of the head of every one of our public institutions to keep the dairy herd free from tuberculosis. How this can be done Dr. Austin Peters, who follows me, will be able to tell us.

VICE-PRESIDENT CHAPIN: I know you have all been as interested as I have been in what Dr. Smith has told us, and it is very refreshing to have the bacteriologists take such a sane position as he has taken and explain their views as clearly as he has. I would call upon Dr. Peters to open the discussion of this paper.

DR. PETERS: Mr. Chairman and Gentlemen, I have been asked to follow Dr. Smith with a few words on bovine tuberculosis, I suppose, perhaps, more with reference to the existence of bovine tuberculosis in herds of public institutions. Dr. Smith has already told us that until within a few years the tubercle bacilli found in cattle and other animals were supposed to be identical with those found in humans; but more recent researches have shown that there is a difference between the bacillus found in human sputum and the bacillus found in lesions in cattle, and a large amount of the credit for ascertaining this difference at first is due to Dr. Smith's studies. I think Koch has observed the same differences, but I think Dr. Smith's researches led to Koch's noticing the difference later. Koch was the original discoverer of the tubercle bacillus, and at first thought that it was identical in animals and man. Originally the tubercle bacillus may have been the same organism, but as a result of its growth for many generations in different hosts it has assumed changes, so that there are varieties, perhaps, of the same organism, but the changes have become so fixed that very likely one form will never revert to that of the other. The human tubercle bacillus has certain differences from the bovine bacillus that characterize it. Probably it would take a great many generations of cultivation under certain conditions to make one identical with the other again, and perhaps it would be an impossibility to do this.

The sputum bacillus is virulent to mankind, but it seems to have very little virulence toward cattle and the lower animals. On the contrary, the bovine bacillus is very virulent in comparison to the sputum bacillus to cattle and to other lower animals and small experimental animals. As the human tubercle bacillus is of very little danger, evidently, to cattle and other animals, and as the bovine bacillus is very virulent to them, it is assumed that the converse is true, and that there is very little danger from the bovine bacillus now to mankind. At the same time, as Dr. Smith has told you, there are instances where the bovine bacillus is found in lesions in children. The truth of this seems to be borne out by the facts, because it is so difficult to trace a case of tuberculosis in a human being to cow's milk. We know that if a man has glanders, it is a very easy matter to find out the horse he got it from; if a man has rabies it is not a difficult matter to find out the dog with rabies that bit him, but if a person has tuberculosis it is often very difficult to trace the source of infection. I think one reason for this is, as Dr. Smith has said, that the infection may be taken into the body and remain latent for a long time in some lymphatic gland, and then under suitable conditions develop. It is very hard to trace a case, so as to say that it came from cattle, without eliminating other possible sources of infection. Then we know that phthisis is no more common in persons working in cow barns than in people following other pursuits, showing that certainly there is very little danger from pulmonary infection when working among diseased cattle.

The experiments tried a number of years ago, under the auspices of the old Society for Promoting Agriculture by Dr. Ernst and myself showed that tuberculous cows, even without having tuberculosis of the udder, could give bacilli in the milk. The cow with a bad case of tuberculosis, even with a healthy udder, can excrete bacilli in the milk. If a cow has a tuberculous udder, of course she is a greater source of danger, and milk from cows of either kind fed in an uncooked state to calves or pigs will produce tuberculosis in them, and if it is injected hypodermically into rabbits or guinea pigs, tuberculosis can be produced in them experimentally. I happen to think of a case where a lot of pigs that were kept at a creamery in New Hampshire, I think there were 100 pigs, were sent down to one of the pork-packing establishments near Boston to be killed. They were fed on the skim milk and buttermilk from the creamery. Of the 100 pigs, 19, or nearly 20 per cent., were condemned by the inspector of the United States Bureau of Animal Industry as tuberculous and unfit for human food. This was probably a milk infection. No one wants to advocate the use of such milk for invalids and children, and the importance of a healthful milk supply should not be overlooked in the consideration of tuberculosis, even if the danger is less than was supposed at one time.

Dr. Smith spoke of the various suppositions as to the infection of human beings with tuberculosis. One was that it was acquired in utero and then developed later in life. This in cattle is an unusual occurrence, and I do not believe that it is any more frequent in human beings. The calf is nearly always born healthy. We know that it is a perfectly possible thing to raise a healthy herd of cattle from a diseased herd. We can take cows with tuberculosis and a tuberculous bull, and keep them in one barn, and take the new-born calves as fast as they come and put them in another barn, where the disease does not exist, and bring them up on healthy cows' milk, and test them at the end of the year with tuberculin, and not more than 2 or 3 per cent. will react. This shows that the infection, as a rule, comes after birth. It seems to be the will of a wise Providence that, as far as tuberculosis goes, the offspring shall, in nearly all cases, have a fair show in the world, and start healthy, and the disease is, in the majority of instances, acquired after birth; while congenital tuberculosis does occur it is very infrequent.

Even if we admit for the sake of argument that there is no danger from the use of milk from tuberculous cows, or the meat products from tuberculous animals, there is another aspect which still remains, and that is the commercial one. Walley classifies tuberculosis among cattle with the four great bovine scourges, the other three being rinderpest, foot and mouth disease, and contagious pleuro-pneumonia. Certainly, a disease which causes the losses to cattle owners that this does is one that no farmer and no public institution can afford to have in a herd if it can be eliminated, because it will cause annual losses, the cattle will not do as well, occasionally one will die with it, and I do not think cows give as much milk or thrive where the disease exists in a herd as where the herd is healthy.

As far as tuberculosis in public institution herds goes, I think a public institution in the State of Massachusetts that has not had experience with tuberculosis in its herd is the exception and not the rule. The one obstacle to the freeing of public institution herds from tuberculosis seems to be a lack of fixity of purpose in the management. Every institution has a board of trustees and a superintendent, and occasionally one will get a new superintendent or some new member of the board of trustees, who will find that the herd is tuberculous and start to eradicate tuberculosis from it. He will have the herd tested and the reacting animals killed, and will disinfect the barns, and only put in tested animals for a while. Then the time of that member of the board of trustees expires, and a new man is appointed, or a new superintendent comes, and they are careless about buying cows, and will buy an untested cow that has tuberculosis, and stop testing the herd once or twice a year, and the first thing you know the herd is as bad as it was before any attempt was made to clean it up. Where this work has been done by the State, and at the State's expense, in a great many instances the money has simply been the same as thrown away. I could give instances of that kind, if necessary. The sporadic effort is of no avail, and it is only a definite and prolonged purpose that will give results that will be productive of good. A herd can be freed by means of the tuberculin test if the stable is thoroughly disinfected, and only tested cows are bought in the future, and the herd is tested once or twice a year. Any intelligent farmer can learn to do this without the State's assistance, but I do not think very many do it.

Recently experiments have been tried in immunizing cattle to protect them from tuberculosis. Koch has done some work in this line, and von Behring. Von Berhing has produced what he calls "bovovaccine," probably an attenuated culture of a human sputum bacillus, a small quantity of which is injected into the jugular vein of a calf two or three weeks old, and then in three months the calf receives another intravenous injection of the same material, five times the size of the first dose, and this is said to produce immunity in the calves. Perhaps if older cows could be immunized in the same way before being put into herds where tuberculosis exists it would be a good thing.

There is a chance for a good deal of study along this line yet. All the cows brought into Massachusetts from without the State are tested either before shipment or after arrival, and most of them after arrival. Last year there were about 20,000 cows brought into Massachusetts, and 13,000 were tested at the stock barns at Brighton by agents of the Cattle Bureau, and of the other 7000 over 4000 were tested after arrival by agents of the Cattle Bureau. Only about 2800 came in on certificates of tests. So we are getting in a position where we are surer that the testing is more honestly done than formerly, and if farmers would only take pains to buy tested cows in making new purchases, and would disinfect the places where diseased cows stood whenever they disposed of any, a much better condition of affairs would be brought about than exists at present.

I do not think, considering the amount of money that the State has expended in assisting farmers to rid their herds of this disease and protect the public health, that the farmers have co-operated with the State authorities as fully as they might; in fact, a great many of them have opposed the State. They have been opposed to the tuberculin test, and called tuberculin a humbug, and an injury to the cow, and a poison, and have done all they could to hamper and impede the work of the Cattle Bureau rather than to assist it. As far as the Cattle Bureau's work goes, at the present time it seems to give the State of Massachusetts a fair system of dairy inspection. We take 1500 or 1600 bad cases of tuberculosis a year from the dairy herds in Massachusetts, and these are cattle that can be easily condemned on a physical examination or have diseased udders. The last year the State Board of Health has also adopted a system of dairy inspection, and has a veterinarian examine the dairy herds. Where he finds a case of tuberculosis it is reported to the Cattle Bureau and an agent is sent to see it, and the cow is appraised and killed. This inspection is perhaps of more benefit to people in Massachusetts from herds owned in the State, but it does not extend the same benefit to consumers of milk coming from outside of the State, and as a great deal of our milk comes from New Hampshire and other States, the same good is not done beyond our boundaries, particularly by the Cattle Bureau.

There is not time here to say much about sanitation in our cattle barns, further than that they ought to be light, well-drained, well-ventilated and clean. With the tuberculin test, better sanitation, and possibly a practical method of immunization, I think that very much could be done towards freeing our herds from tuberculosis; but even without a practical method of immunization, with tuberculin alone, we know that we can free a herd from tuberculosis, and if the owner will buy only tested cows, and test the herd twice a year, spring and fall, he can keep a clean herd. Sanitation alone is not sufficient. It may work very well with people, but I doubt if sending tuberculous cows to the State sanitarium at Rutland would avail very much for them. I think that if the tuberculous cows that have showed evidence of disease are destroyed and those that react to tuberculin are taken out of the herd, with that sanitation will be a help, but sanitation alone will not do everything for the cattle, as much as it will for people.

I think, gentlemen, this is all I have to say about the dairy cow.

VICE-PRESIDENT CHAPIN: The discussion of Dr. Smith's paper is now open to the house.

DR. GAGE: I would like to ask Dr. Smith one question, for information, as to whether if a farmer imports cows he is obliged to have them inspected by the local inspector in the district in which he lives, or whether he can select any inspector endorsed by the State Board.

DR. PETERS: Any one who brings into Massachusetts cattle upon which a test is required is entitled to have his animals tested by an agent of the Cattle Bureau. If cattle are brought in from without the State I send some one to test them.

DR. MILLER: I would like to ask the doctor if all cattle brought into the State are tested.

DR. PETERS: No, I think there are some cattle that are brought across the line from New Hampshire and Vermont by people in abutting towns, who bring them over in the night without saying anything, that are not tested. I think all the cattle brought in by rail are tested, because we hold all the cattle that are brought to Brighton and test them there, that is, all the cattle except beeves, for immediate slaughter and calves under six months old. At points outside they have to have a permit to bring the cattle into the State, and the railroad won't take them without a permit. But where a man can drive cattle from New Hampshire, Vermont or Connecticut along the road into Massachusetts, I think some are brought in in that way without our knowing anything about it.

VICE-PRESIDENT CHAPIN: As you see, Dr. Durgin had arranged that I should read the next paper. I am sorry to take up any more of your time this afternoon. I will try to be as brief as possile. What I wanted to do was to discuss the causes of death in Providence. I have prepared a table which shows the deaths per 100,000 of the population from all the different causes by five-year periods for fifty years. That, of course, was too large to bring here, but I have brought a table in which the first-column figures show the average number of deaths per 100,000 for the whole period of fifty years. Thus, for fifty years, we have averaged 45 deaths per 100,000 from typhoid fever. In the beginning of that period, the first ten years, the deaths were 64; the last they were 17. They increased somewhat, and then fell off again. The difference between 64 and 17 was 47, so that during this period the disease diminished 47 per 100,000. That is the meaning of the two sets of figures.

CAUSES OF DEATHS IN PROVIDENCE, 1856-1905.

By Charles V. Chapin, M. D.

Superintendent of Health, Providence, R. I.

During the period under consideration the crude death rate in Providence has fallen from 20.87 to 18.90 per thousand. As you doubtless well know, a crude death rate is of very little value as an indication of the sanitary condition of a city. Mr. Hoffman, actuary of the Prudential Insurance Company, read an interesting paper last week before the American Statistical Association in which he made use of over twenty factors in correcting crude death rates, and stated that as many more might be employed. Among important factors influencing the death rate are age, sex, race and social condition. Probably the most important factor influencing the death rate is the age distribution of the population. Many of the other factors considered by Mr. Hoffman are more or less dependent upon this.

One of the important uses to which vital statistics are put is to enable health officers to judge whether or not their efforts have been successful, and to suggest direction for their future activity. For this purpose we must study the different causes of death. Among the diseases to which health officers have given the most attention are typhoid fever, scarlet fever, small pox and diphtheria and croup. A glance at the table shows that all these diseases have diminished and very markedly so. The decrease, however, is partly due to a decided decrease in the population at those ages most subject to these diseases. The apparent decrease in these four diseases amounts to 214 per 100,000, of which perhaps a quarter is due to different age distribution. I am of the opinion that a large part of this decrease is largely due to the conscious effort of the municipality. The decrease in typhoid fever is probably due almost entirely to the introduction of a public water supply, its improvement, the abolition of privy vaults, etc. The decrease in small pox, scarlet fever, and diphtheria have doubtless been largely due to measures of isolation insisted on by the health department, to vaccination, and the distribution of antitoxin.

Two other diseases show a great apparent decrease, and a similar decrease in other cities is usually claimed by their sanitary officials as due to their own efforts. The decrease in diarrhoeal diseases is apparently 79, but it is very difficult to determine what the real decrease has been. Most of the deaths from this class of diseases are at ages under five years, and the proportion of the population in Providence, at this age, has decreased about 25 per cent., a greater decrease than the diseases have shown. On the other hand, improved methods of diagnosis have probably transferred some deaths from meningitis, marasmas and debility to diarrhoea. On the whole, I judge there has not been a great deal of decrease in this group of diseases, and this is further indicated by the fact that the ratio of deaths under one year to births, has shown an increase of 34. While the health department of Providence has not accomplished much in the prevention of these diseases, yet more can be accomplished if there can be exercised proper methods of controlling the milk supply, and means devised for instructing mothers in the care of their children. The whole subject of infant mortality is one that needs more careful study by health officials, and I know of no more promising field for their efforts. The disease which has shown the greatest apparent decrease during the last fifty years is consumption. There were 169 less deaths per 100,000 during the last ten years. The reality of this decrease has been questioned in many quarters, but I am inclined to think that it is very largely a real decrease. It is indeed probable that some cases may have been transferred to pneumonia for the purpose of defrauding insurance companies, but I am satisfied that in Providence this number is not large. On the other hand, it is likely that in former years many cases of consumption were incorrectly diagnosed as bronchitis. Changes in the age distribution of the population would tend towards increase to a considerable degree. Race is an important factor in this disease. Hebrews are much less susceptible to it than other white races and their recent influx to cities like Providence and Boston would tend to its decrease. But in Providence there has been a marked decrease in consumption among persons of American parentage, which class contains an increasing number of Irish descent who are especially susceptible, so that there seems to be no doubt that consumption has decreased decidedly independent of the age or race distribution of the population. Little credit for this decrease in consumption is assumed by the health department in Providence. It is possible that the efforts of the department, and of practising physicians have accomplished a little in preventing infection in this disease, but it is probably very little. In this connection it may be noted that tuberculous diseases other than consumption have shown a quite decided apparent increase from 0 to 40 per 100,000. It is probable that this is wholly due to improved diagnosis. Thus it can be seen that scrofula has diminished 20, or half the above amount, and has probably in reality been transferred to tuberculosis. Other cases of tuberculosis were formerly returned as marasmas, meningitis, or enteritis, or hydrocephalus.

Your attention is now called to several other diseases which are usually classed as preventable, and which health officials attempt more or less vigorously to restrict. These are measles, whooping cough, cerebro-spinal-meningitis, influenza, and pneumonia. According to the chart, measles has increased five, and whooping cough has diminished eight. If the two were taken together it will be seen that there has been little apparent change in their mortality, and this I think is correct. When it is remembered that the population at the susceptible ages has decreased, no credit is due the health department for controlling these diseases. Very little has been done towards controlling whooping cough in Providence, and only half-way measures have been adopted in regard to measles. Probably in both these diseases it makes no difference whether the most stringent measures are adopted or nothing is done. The health officer of Aberdeen has recently issued a most interesting report on measles. For over twenty years that city attempted to control measles as we in this country attempt to control scarlet fever. The disease remained practically stationary, and the mortality did not differ much from that in other Scotch cities where practically no restriction was attempted. It is worthy of note that at the present time the mortality from each of these diseases is greater than that of scarlet fever. As I have tried to show on other occasions, restrictive measures in contagious diseases will not be successful unless a large proportion of the infected persons can be controlled from about the beginning to the end of the period of infection. This we cannot hope to do in these two diseases, and hence the failure of all attempts. For similar reasons health officials have been able to do nothing to check the spread of cerebro-spinal meningitis. This disease in Providence has shown an increase from 0 to 8. Owing to the large number of well persons who are infected with the influenza bacillus and the pneumococus, restriction can avail nothing in the diseases caused by them. Influenza appeared in Providence in December, 1889, and caused the maximum number of deaths during the next five years, since which time it has diminished. Pneumonia has shown an apparent increase of 51. It is to be doubted, however, whether this is real. During the last fifteen years it is probable that many cases of influenza have been reported as pneumonia, as suggested by the culmination of the pneumonia mortality in the same period as that of maximum influenza mortality. Allowing for the increase due to improved diagnosis and to change in the age distribution of the population, it is doubtful if pneumococcus pneumonia has shown any real increase.

It is really surprising how few diseases there are among those common in New England over which health officials can exert any real control. The common belief is that the health of the community rests almost entirely with the board of health, and if there is any marked decrease in the general death rate credit for it is almost invariably claimed by the officials in charge. It may be objected that the municipality has done much to reduce the general death rate over and above that caused by the contagious diseases by improving the sanitary conditions so called. If by this is meant municipal cleanliness, no one has ever shown how it has any effect upon the death rate except in a limited number of diseases. If by sanitary condition is meant the social and economic condition of the people, then taxes, trusts, trades unions, the tariff and similar factors have far greater influence than any of the direct sanitary activities of the municipality.

There are a number of diseases, the mortality of which it is generally believed that modern medicine has done much to reduce. Among these are the accidents of child-birth. We are not surprised to see that deaths from child-birth have diminished three, but it is rather surprising to find that puerperal fever has shown an increase, even though it be only to the extent of one, particularly as the number of confinements has materially diminished. It is also surprising to find that septic infections have increased, though perhaps it may be due to greater accuracy in death returns. Diseases of the female genital organs caused six more deaths, notwithstanding the great number of ovarian custs and pus tubes that are successfully operated on. Perhaps, however, there is an actual increase of salpingitis, owing to an increase of gonorrhea. It may also be noted that deaths from tumor have remained stationary, notwithstanding that more accurate diagnosis has removed a large number of cases from this indefinite class. Appendicitis only appeared as a cause of death in 1890, yet it now causes 17 deaths per 100,000, although the surgeons save so many cases. Some of these deaths would doubtless formerly have been attributed to peritonitis, which has decreased four, but it is rather curious that appendicitis and other diseases of the intestines, together with peritonitis, have shown a net increase of 18. It is satisfactory to learn that deaths from erysipelas have decreased 17 and from hemorrhage 8.

If we glance over the list of diseases it will be seen that in those which exhibit the greatest decrease, the change has probably been due to more accurate diagnosis. This is certainly true in diseases of the brain, convulsions, hydrocephalus, debility, teething, old age, dropsy and unknown causes, a total of 278. Of these convulsions, hydrocephalus, debility and teething were almost exclusively reported in infants, and from them diarrheal diseases, diseases of the stomach and tuberculosis have been largely recruited, and to this cause is due the apparent increase of the latter. The other members of this group were usually certified to in old people, and the increase in kidney disease, heart disease, arterial disease, bronchitis, and definite diseases of brain and cord, are to some extent transfers from brain disease, old age, dropsy and the unknown group. In fact, the nature of the causes classed as unknown, at present 28 per 100,000, is probably entirely different from what it was fifty years ago.

Insanity shows an apparent decrease in Providence, but it is only apparent, and is due principally to the fact that many cases of insanity are sent to the State institution outside of the city, where they die. Also deaths which would formerly have been attributed to insanity are now attributed to arterial sclerosis, cerebral hemorrhage, kidney disease, or other underlying or intercurrent affections. Thus in Butler Hospital for the Insane, which is within the city limits, most of the deaths were formerly attributed to insanity, but now very few are. Hence our vital records tell us nothing as to whether insanity has or has not increased. The same is true of diseases of the nervous system in general. Besides insanity, brain diseases, including meningitis, paralysis, epilepsy and hydrocephalus, have decreased 94, and other diseases of the nervous system and apoplexy have increased 58, but there has been so much change in diagnosis that it is impossible to draw a satisfactory conclusion. Alcoholism has decreased 11 and I am satisfied that this is a real decrease.

Among the diseases showing an apparent increase there are only a few in which it is certain that the increase is not to be explained by more accurate diagnosis, or changes in the age and sex distribution of the population. These are influenza, cerebro-spinal-meningitis, suicide, accidents and homicide. The deaths from suicide have doubled. Accidents have shown a notable increase, but mostly in that class due to new machinery or trades, such as electric car accidents, railroad and machinery accidents and poisoning by water gas The homicides in Providence have more than doubled.

The number of deaths from syphilis is small, but has doubled, and is likely to be due to more accurate diagnosis.

As to whether cancer has increased except as may be explained by improved diagnosis, and changed age distribution, is not clear. That the former cause has operated to a considerable extent is shown by the fact that accessible cancer, as that of the breast, has not increased as fast as cancer of the internal organs. In fact, Newsholme has shown from carefully prepared European data, that it is almost certain accessible cancer has not increased at all. The proportion of the population at the cancer age has increased over 50 per cent. I have not as yet had time to study the death rate from cancer in all its details, but it would not be surprising if it showed no increase at all in the sense understood by laymen. Diseases of the heart and arteries, and especially diseases of the kidneys, have shown a very great apparent increase, but what has been said of cancer applies almost equally well to them. We do not know that it indicates any increased liability on the part of the individual.

The increase in bronchitis like that of pneumonia is doubtless due to changes in age constitution, improved diagnosis, and the influenza bacillus. Increase in diseases of the stomach is due probably to transference from convulsions and malnutrition, and the increase in premature birth to transference from debility. The small increase which occurs in several other diseases is probably also due to more accurate diagnosis.

CAUSES OF DEATH IN PROVIDENCE FOR FIFTY YEARS, 1856-1905.

The first column shows the average number of deaths for the whole period of fifty years.

The second column shows the increase or decrease between the first decade and the last decade of the fifty year period.

	Average Rate per 100,000 1856-1905	Increase or Decrease between 1856-'65 and 1896-1905
Typhoid Fever	45	− 47
Malaria	4	+ 4
Small Pox	1	− 7
Measles	14	+ 5
Scarlet Fever	53	−114
Pertussis	21	− 8
Diphtheria and Croup	77	− 46
Influenza	15	+ 23
Erysipelas	7	− 17
Septic Diseases	4	+ 4
Phthisis	265	−169
Tubercular Diseases	36	+ 40
Scrofula	3	− 20
Syphilis	5	+ 2
Cancer	62	+ 41
Tumors	7	0
Rheumatism	7	0
Diabetes	8	+ 9
Anemia, Etc.	4	0
Alcoholism	12	− 11
General Diseases	2	+ 1
Cerebro-Spinal Meningitis	6	+ 8
Brain Diseases	58	− 31
Cerebral Hemorrhage	68	+ 52
Paralysis	18	− 7
Insanity	11	− 10
Convulsions	36	− 39
Epilepsy	5	− 1
Tetanus	1	0
Diseases of Nervous Syst.	8	+ 6
" " Heart	128	+ 78
" " Arteries, etc.	7	+ 19
Hemorrhage	9	− 8
Diseases of Larynx	2	+ 1
Bronchitis	54	+ 49
Pneumonia	172	+ 51
Respiratory Diseases	9	+ 1
Diseases of Mouth, etc.	2	− 4
Stomach	25	+ 23
Diarrhœal Diseases	195	− 79
Hernia	4	+ 3
Diseases of Intestines	13	+ 19
Peritonitis	13	− 4
Diseases of Liver	24	+ 5
" " Kidneys	79	+127
Urinary Diseases	8	+ 7
Diseases of Females	4	+ 6
Puerperal Fever	8	+ 1
Child Birth	11	− 3
Gangrene	3	0
Abscess	5	− 1
Skin Diseases	2	− 3
Organs of Locomotion	3	+ 3
Hydrocephalus	19	− 55
Malformations	12	+ 5
Debility	46	− 21
Premature Birth	26	+ 34
Teething	8	− 21
Old Age	57	− 44
Suicide	9	+ 6
Insolation	2	+ 4
Accidents	69	+ 22
Homicide	2	+ 1
Dropsy	5	− 21
Unknown	31	− 46

These are a few of the thoughts that have come to me as I have been studying the death returns in Providence, and when Dr. Durgin asked me to read a paper this afternoon, I thought I would like to present them here, chiefly in order that I might get suggestions from others as to a further study and analysis of these factors. I should be very glad to have any suggestions.

DR. HARTWELL: Dr. Durgin called me up by telephone the other day, and told me of this meeting this afternoon. I ought to have known all about it, but I have only vague recollection of receiving an envelope with the imprint of the Association upon it. Taking it for a bill, which could be attended to any time within thirty days, I did not open it. Consequently, when Dr. Durgin asked me to open the discussion on Dr. Chapin's paper on the "Death Rates of Providence for Fifty Years," I supposed crude death rates were meant. I am glad, however, that the subject of the paper is "Causes of Death in Providence," partly because I shall more easily limit what I have to say, and more especially because causes of death is a very much more interesting and instructive topic than crude death rates.

After Dr. Chapin's remarks on his table it does not need to be interpreted. I shall not linger upon that or dwell upon the points which Dr. Chapin has so well brought out. As I see it, the main lesson for those who study and those who make vital statistics, conveyed by the paper and the table, may be summed up in "Go thou and do likewise." He has confined his attention to the material gathered in a city that has grown within the memory of many fourfold, from a town of 45,000 to a city of nearly 200,000 inhabitants. In this State there are many cities that have grown at a like rate, but not very many that have reached the same proportions. I hardly think that very many of our cities in Massachusetts have such a series of tables as constitutes the material from which Dr. Chapin has made his table. Nevertheless, we are at least approaching the point where the vital statistics of the cities of Massachusetts contain a mass of data that ought to be digested, decomposed, if you like, and recomposed in accordance with the methods of modern statistical science.

Dr. Chapin's paper has one feature which cannot be too highly commended, it seems to me. He has confined his attention to the statistics of his own city, and has not indulged in the slightest comparison with any other city. That means much—more than is at first apparent, perhaps. A low death rate has come to be considered a good and necessary asset in many cities, and so a low death rate has been figured into existence, I venture to say, in an undue number of American cities within the last fifteen years. I cannot see what sanitary or other work has been done that will account for such startling declines in the death rate, as are frequently claimed in the reports of some hustling health officers, particularly in the West. Let us study the crude death rates in our own localities for a series of years; split them up where we can into death rates from special causes, especially for different age-groups, taking account of occupation and environment when it is possible, then shall our vital statistics become more serviceable and shed much more light on the condition of the public health than they have hitherto.

It is to be hoped that the final tables which Dr. Chapin spoke of will set forth those diseases that are most susceptible of prevention and regulation, death rates by age groups and sex, e. g., the age group, ten to fifteen, or five to fifteen. In the interval between ten and fifteen death rates, at least crude death rates, are lower than in any other period of like duration in human life.

Dr. Chapin alluded to final tables in which the causes of death in Providence will be subjected to more detailed analysis than is shown in the table before us. It is to be hoped that he will find it practicable to determine, for a series of years, the mortality rates for the more significant diseases, especially those that are measurably capable of prevention or regulation, by sex and age groups. Crude death rates are lowest for persons between ten and fifteen years of age.

Hence, even the crude death rate from the age group five to fifteen (since its members are least susceptible to lethal influences), would serve us as a useful criterion of the health of a community. I have shown that during the period of accelerated growth in height and weight, i.e.,in the age period, ten to fifteen, the death rates of Boston children reach their minimum, but that the year of lowest death rate for girls falls one or two years earlier than for boys. How far this is true as respects special death rates remains to be determined. It is to be hoped that Dr. Chapin's paper can be utilized towards settling the question, and be made to yield tables showing death rates by individual years of age, i. e., 0—21 years—for each sex, for certain diseases, in census years, e. g., the developmental diseases, so called. I specify census years since it is only in those years that we have any approach to an accurate estimate of composition of the population by ages.

In the present state of the art of making tables of death-rates, especially for purposes of comparison between different States and cities, it is best to leave post-censal years out of account, as there is much diversity of practices, or rather an almost total lack of system in estimating population in such years, there is urgent need that municipal registrars and health boards should correct their estimates of population for inter-censal years for the purpose of correcting their published death rates for the past fifty years.

In this connection I may say that I have in preparation a table to show the corrected death rates of the city of Boston from 1800 to 1905, in which the observed increase of population from census to census is used as the basis for determining the true estimate of population for inter-censal years. Such corrected death rates are a desideratum, if a period of long duration is under consideration, owing to the inevitable fluctuations in the rate of growth in population. For instance, the population of Boston increased 12.9 per cent. in the period 1895-1900, and only 6.2 per cent. in the period 1900-1905. In other words, if the rate of increase in Boston's population which actually did obtain between 1890 and 1900 had obtained between 1900 and 1905, we should have had 30,000 more people in Boston last May than were found by the enumerators. Naturally, the published death rates since 1900 have been computed on the earlier and larger rate of increase. As in Boston, so in Massachusetts, the rate of increase of population has varied for half decade to half decade since 1870, with no approach to uniformity.

There is a widespread and mischievous tendency to indulge in per capita comparisons of cities as regards death rates, pauperism, debt, etc., etc.; but such comparisons are for the most, misleading, not to say worthless, because of wild estimates of population in other than census years. For instance, the Health Officer of Cincinnati figured out a death rate of 13.74 per thousand for that city in 1897, on an estimated population of 405,000 against an estimate of 350,000 for 1896. He got his 405,000 population by multiplying the number of voters registered at the presidential election of 1896 by five, which he assumed as "a usual ratio." The census enumerators found only 325,902 persons in Cincinnati in 1900, the official death rates of that city were from 3.66 to 3.81 in the thousand too low for the years 1897-1899. Again, the death rate of Baltimore in each of the three years, 1898-1900, was figured on an estimated population of 541,000, though the population in 1900 as shown by the United States Census was only 508,957. At the same time a writer in the "Charities Review," in 1898, indulged in per capita comparisons relating to relief of the poor to the manifest advantage of Baltimore, since he credited Baltimore with 625,270 inhabitants in 1898, on the strength of "an official estimate."

In other branches of vital statistics, e. g., birth rates, the situation is even worse. Some years ago I computed the mean death rate and mean birth rate for the year 1901 for the ten largest cities in the country—using the figures given in an official publication of one of the departments of the United States Government. For an estimated population of upwards of 9,000,000, the birth rate, viz., 18.99 exceeded the death rate by only 1.14 per thousand, indicating an excess of births over deaths of only 11.185 for the ten leading cities of the country taken together. Three out of the ten, viz., Baltimore, San Francisco and Cincinnati, showed without a tremor, without a symptom of apology, a total of 4.878 deaths more than births!

Clearly there is opportunity for much honest, careful, scientific work on the part of local registrars and official compilers of vital statistics. As a rule, the records of deaths appear to be more nearly correct than those of births, and are more promptly made than the returns of marriages. There is opportunity in this field for a campaign of education by boards of health for the purpose of awakening a keener sense of duty among physicians and clergymen as regards making their returns of births and marriages more full and prompt.

I welcome Dr. Chapin's paper as one of a new sort, that we ought to have more of. I hope that in the course of the next few years we shall have similar studies of the causes of death in individual cities and towns of Massachusetts. For such studies Dr. Chapin's paper may well serve as our model.

VICE-PRESIDENT CHAPIN: If there are no other remarks the meeting is now adjourned.

MUNICIPAL SANITATION.

By Charles V. Chapin, M. D.

Superintendent of Health, Providence, R. I.

GARBAGE REDUCTION. The garbage of New Bedford is now being treated in a new form of reduction apparatus. The works were designed and built by the American Extractor Company of Providence. They were completed last summer and since then practically all the garbage of New Bedford has been there disposed of. The capacity of the works is sufficient for handling a great deal more garbage than is delivered. The most notable features of the plant, and those which distinguish it from other reduction works are the general excellence of construction, and the contrivance for expressing the water from the digested garbage. The garbage is dumped onto a concrete platform in a separate building where it is allowed to drain, and is shoveled once or twice and all the tin cans, stones, pieces of iron, etc., picked out, when it is finally thrown onto a conveyor which carries it automatically into the digestors. This part of the process might give rise to nuisance if the building was not well built and ventilated, and carefully looked after, as it is in New Bedford. The digestors extend up two stories, are eight feet in diameter and made of two-inch cast manganese iron. The garbage is digested for a number of hours, and the grease which rises to the top, is forced over into tanks, where it is separated from the water, and is finally drawn off into barrels. The garbage, now boiled into a pulpy mass, called tankage, is drawn off through a valve from the bottom of the digester, and passes through a peculiar press, which is continuous in its action. It is really a great worm, into one end of which the wet tankage falls and is gradually forced through by the motion of the worm, the water at the same time being expressed. A somewhat similar apparatus is used in paper mills, but has been much modified for this work on account of the very heterogeneous character of garbage tankage. It was said that only 50 per cent. of moisture was left in the tankage, and it certainly appeared to be as dry as that. This is a most excellent result. The tankage then drops into a dryer on the ground floor, from which it comes out dry enough to be sold to the fertilizer manufacturers. The apparatus is constructed so as to be continuous throughout, and the material when once thrown onto the conveyor, is not again exposed to the air until the dry tankage and the grease are discharged. The vapors are constantly drawn out of the apparatus and condensed with sufficient water to render them innocuous, and the gases are consumed in the fires. The works are well built and are said to have cost $75,000. The machinery seems to be substantial and much care has been given to the details of construction. There is no reason why the works should not be operated without any nuisance, and they were so operated at the time of the writer's visit in November.

TEMPERANCE PLACARDS. Although it is well recognized that the abuse of alcohol is an important factor in the causation of sickness and death, American health officers have held aloof from temperance work. In England the matter is being seriously considered by sanitary officials. Dr. Niven, the medical officer of health of Manchester, not only believes, as we all do, that the abuse of alcohol predisposes to tuberculosis, but he thinks that the public house is the source of a great deal of tuberculous infection. The facilities for the transference of sputum in such places are abundant, and he is desirous of having them conducted in a more cleanly manner. Dr. Priestly* of Lambeth has had placards printed, setting forth the dangers to health from the use of alcohol, and has posted them in shop windows and on fences and the walls of buildings. This has also been done in several other London boroughs, and in some provincial cities. Apparently these placards were considered by the liquor dealers to be effective and therefore a danger to their business, for the South London public houses were not long afterwards placarded with notices insisting upon the virtue of alcohol as a preventive against consumption.

PREVENTION OF NOISE. The Board of Health of Fitchburg has a large placard bearing the legend, "KEEP QUIET, THERE IS SICKNESS IN THIS HOUSE." All persons are forbidden making any noise or disturbance in this neighborhood." The day before the Fourth of July this is placed on houses whose occupants ask for it, provided the board believes that the sickness is grave enough to demand this help, and the police are notified to see that the order is obeyed. It is obeyed to the great satisfaction of the neighborhood.

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*Public Health, XVIII, 1905-06, pp. 165, 221.

SANITARY ENGINEERING NOTES.

By Robert Spurr Weston, Asso. M. Am. Soc. C. E.

VARIABLE VIRULENCE OF TYPHOID FEVER. Professor Mason of Troy, N. Y., in a recent number of the New England Water Works Association Journal, pointed out that epidemics of typhoid fever spread by water from polluted wells had higher mortality than epidemics caused by drinking water from polluted rivers, owing to the decrease in toxicity of the bacteria during their struggle for existence in the stream. He also called attention to the fact that the death rate was lower during a severe epidemic of typhoid than it was when there were a few cases in a city—probably owing to the fact that in the latter case many of the recovering cases were not reported.

In discussion Dr. Soper corroborated these opinions, but thought that cases were often reported during epidemics which were not typhoid. Waves of these enteric diseases frequently precede the typhoid epidemics and if faithfully reported might give sufficient warning of the trouble brewing.

SOFTENING PLANT AT OBERLIN, OHIO. In a recent number of the Journal of the New England Water Works Association, Mr. Gerrish describes the recently-constructed softening plant, where very good results have been obtained. This plant cost $12,000 and by its operation adds about two and one-half cents per thousand gallons to the cost of the water delivered to the consumer. The natural water has about ten grains of calcium carbonate and six grains of magnesium sulphate per gallon, which are reduced by this process to 2.0 and 0.6 grains per gallon, respectively. The purification is brought about by the addition of lime and soda. Mr. Gerrish points out that the reaction is a slow one and long storage greatly increases the effectiveness of the plant. After six days standing little or no further precipitation occurs.

COPPER SULPHATE AS AN ALGACIDE. At the September meeting of the New England Water Works Association the use of copper as an algacide was treated by a symposium on the subject by different authorities, about sixteen different experts reading papers or taking part in the discussion. The results are interesting and are published in a special number of the Journal which will repay reading.

The facts brought out show the importance of knowing the volume of water to be treated, the species of plant to be destroyed, the temperature of the water and the kind of fish in the lake, because the resisting powers of the different organisms vary greatly under different circumstances.

Algae appear in periodic waves and the application of the destroying chemical must be also periodic. In order to destroy bacterial life at all times the supply of chemical would have to be continuous. This seems impracticable, although it might be of use in a sudden epidemic or in the treatment of sewage effluents.

Bacteria are thought to be more resistant to copper sulphate than are algae. The harmlessness of copper in small quantities was mentioned; also the fact that it disappears in combination with organisms, and if imbibed in this form was not believed by some of the speakers to cause trouble. Experiments show that in good, clean water the copper is precipitated in a much shorter time than if the water is highly colored, and as much as 50 per cent. of the copper added may be kept in solution for a long time.

NEW WATER WORKS AT THE ISTHMUS. A reservoir having a capacity of 400,000,000 gallons has been built for the city of Panama. Almost a mile of pipe leads from this reservoir to a 1,000,000-gallon distributing reservoir. This system has been in use since July, 1905, and the water has been very satisfactory.

Panama has also a sewerage system. This is on the combined principle and the outlet discharges directly into the bay.

SEWAGE DISPOSAL AT BERLIN, OHIO. The Engineering Record gives a description of the extension of the sewage disposal plant at Berlin, O. Two septic tanks, two sewage tanks, a pumping station and fourteen acres of intermittent sand filters have been constructed. The trouble caused by factory wastes was overcome by special treatment at each factory. The septic tanks have a capacity for a 24-hours' flow. The sewage is pumped from the sewage tanks to filter beds once each day.

POLLUTION OF SHELL FISH. Mr. George W. Fuller in a recent address before the U. S. Sanitary Association, describes several methods of purifying sewage on the Atlantic seaboard. He stated that in England results show that from 8 to 50 per cent. of the typhoid fever cases in coast towns and cities are believed to have been caused by shell fish. Mr. Fuller believes that the value of the fisheries must be taken into account when sewage purification systems are proposed.

SEWAGE DISPOSAL AT OBERLIN, OHIO. The experiment of adding lime and iron sulphate to sewage has been tried at Oberlin, Ohio, in order to increase the precipitation of solids at the sewage farm. The wisdom of this process has not yet been determined upon.

LABORATORY NOTES.

By Frederic P. Gorman.

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THE ROLE OF THE LEUCOCYTE. The chief evidence that the leucocyte plays a part in immunity is the fact that these cells have been observed to engulf and destroy bacteria. Recently it has been found possible to bring this property of the leucocytes under laboratory observation in a way that enables one to measure the phagocytic power of the blood in different individuals or in the same individual at different times. It may be that future experiments may develop a method of increasing this property of the leucocytes and so increase the immunity of an individual. In a paper read before the recent meeting of the Society of American Bacteriologists at Ann Arbor, Mich., Doctors McFarland and L'Engle of Philadelphia described their technique for the determination of this property of leucocytes. The method was originally devised by Leishman and modified by Wright and Douglas* and still further modified by the authors. The blood to be tested is mixed with a uniform suspension of a twenty-four-hour culture of Staphylococcus pyogenes aureus. Smears made from the mixture are stained with Marino's stain.** The average number of bacteria found within the leucocytes is taken as the index of opsonic power. The authors examined the blood of fifteen presumably normal individuals and found that the phagocytic index varied from 23.125 to 4.35. In two cases in which the counts were repeated at intervals of five days there was a remarkable uniformity in one case and a distinct variation in the other. The experiments were all performed between the hours of three and five in the afternoon. They also found that the number of bacteria taken up by the leucocytes varies with great regularity according to the strength of the bacterial suspension used. Hence, we have endeavored to use a uniform suspension in all of our experiments. The clinical bearing of these experiments is indicated by the fact that those individuals whose phagocytic index was lowest had suffered from carbuncles or boils or become easily infected from slight causes.

They conclude as follows:

"1. Leishman's methods of determining the phagocytic power of the blood, as modified by Wright and Douglas and by ourselves, is a very simple method adapted to clinical application.

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*Proc. Roy. Soc. Lond. LXXIII, 1904, 128.

**Ann. Past. Inst. XVIII, 1904, 761 and XIX, 1905, 351.

2. Marino's stain is most appropriate for demonstrating the leucocytes and the contained bacteria.

3. There is no uniformity in the phagocytic indices of the bloods of supposedly healthy individuals.

4. The phagocytic index of the same individual may be constant or it may vary upon different days.

5. An exceptionally low phagocytic count usually indicates a present or past predisposition to suppuration (the phagocytic index in this regard being determined by the use of Staphylococcus pyogenes aureus).

6. The phagocytic index may not be below the average in all cases in which there has been a tendency to suppuration."

LEUCOCYTES IN MILK. In this connection also the question of the meaning of leucocytes in milk is important. Is the number present a measure of the health of the cow and can a determination of the number present be of any assistance to the sanitarian? These questions are at present under discussion and meanwhile the methods of determining the number are receiving a searching examination. The first method proposed was that of Dr. Stokes of Baltimore. Ten cubic centimeters of milk were centrifuged for five minutes. The cream and milk were then poured off, allowing the sediment to run to the bottom of the tube. The tube was then allowed to stand for an instant until a few drops had gathered at the bottom, when the contents were stirred up with a platinum loop, and a loopful was then spread on a coverglass, dried, flamed, and stained with methylene blue. Under the one-twelfth objective a number of fields were counted, and the average taken as the leucocyte count.

The next modification of this method was that of Doane and Buckley of the Maryland Agricultural Experiment Station.* Ten cubic centimeters of milk are centrifuged for four minutes in graduated sendimentation tubes, at an approximate speed of 2000 revolutions per minute. The cream is lifted out with a cotton swab, as much fat being removed as possible. It is then centrifuged for one minute more, and the cream again removed. The milk above any sediment which may have collected is removed with a small siphon to about the 1-2 c.c mark. Two drops of a saturated alcoholic solution of methylene blue are then added, thorougholy mixed with the sediment by shaking, and then set in boiling water for two or three minutes. Water is added to the one c. c. mark. The leucocytes in the solution are counted by means of an ordinary blood-counting apparatus and the number per cubic centimeter is then estimated.

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*Maryland Agriculture Experiment Station Bulletin No. 102.

A comparison of these methods shows that there is much to be desired in both as far as uniform results are concerned. If it is of any value to know accurately how many leucocytes are in a given sample of milk, other more exact methods must be adopted.

THE DIRECT MICROSCOPIC EXAMINATION OF MILK FOR BACTERIA. Dr. Francis H. Slack of the Boston Board of Health Laboratory has recently advocated* the direct microscopic examination of the sediment from a sample of milk, for the determination of the number and morphology of the bacteria present, as well as for leucocytes and streptococci.

The special apparatus used for centrifugalizing the milk samples consists of an aluminum disc and cover ten inches in diameter and five-eighth inch in depth, fitted to hold twenty small glass tubes, arranged radically. These tubes hold about two cubic centimeters each and are closed at both ends with rubber stoppers.

The samples in the tubes are centrifugalized ten minutes at a speed of 2000 to 3000 revolutions a minute, thus collecting the whole sediment from each sample on the outer stopper.

The sediment is obtained by breaking up the cream, pouring out the milk and carefully removing the stopper with the adhering sediment, not allowing any milk to run back on the sediment to disturb it. It is then evenly smeared with a drop of sterile water over a space of 4 sq. cm. on a glass slide, dried and stained with methylene blue.

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*Ann Arbor Meeting of the Society of American Bacteriologists.

The number of bacteria found in a representative one-twelfth oil immersion field bears a fairly constant relation to the 1-10,000 plate culture (grown for twenty-four hours in a saturated atmosphere at 37 degrees C., 1 per cent. agar being used with a reaction of +1.5).

Thus, as a rough estimate, each coccus, bacillus, diplococcus or chain in a representative one-twelfth oil immersion field represents 10,000 bacteria to a cubic centimeter in the sample of milk examined.

Advantages are: rapidity of examination, accuracy, easily-learned technique, lack of costly apparatus.

Dr. Slack believes that the method can, in experienced hands, safely be used for certifying milk, certifying those samples in which no bacteria are found, since the large number of samples which could be examined and the increased efficiency of the supervision more than compensates for a slightly greater accuracy in plate counts.

ISOLATION OF TRYPANOSOMES. In view of the increasing importance of a study of the Protozoa infecting man and the lower animals any suggestions as to technique are important. In connection with a most interesting discussion and demonstration of their work with trypanosomes, Doctors Novy and Knapp, at the Ann Arbor meeting of the Society of American Bacteriologists, described their methods of isolating trypanosomes from accompanying bacteria. The same or a similar method might be used with other protozoa.

In general, it may be said that bacteria once introduced into a culture of trypanosomes tend to outgrow and check the development of the flagellates. In exceptional instances, however, the bacteria thus introduced exert little or no interference and may be even apparently beneficial. While in the former case the trypanosomes die out, in the latter instance the mixed culture may be kept for six months longer.

The isolation of the trypanosomes in pure form from such mixed cultures is a matter of some importance, especially when it is desired to study the pathogenic action of the flagellates. The need of some method of separation was particularly felt in connection with the study of the mosquito trypanosomes which, since they are present in the intestinal canal, are always accompanied by various bacteria and yeasts. After many ineffectual attempts the following method was successfully employed for the isolation of pure cultures of herpetomonas and crithidia.

By means of a small glass spatula, made by drawing out the end of a glass rod, a little of the mixed culture was spread in a series of streaks over six Petri dishes containing solidified blood agar. The Petri dish, known as the "Kriegsministeriums-Modell 2," made by Greiner and Friedrichs, is particularly adapted for this purpose, inasmuch as it can be sealed effectually by means of a wide rubber band. The sealed dishes are then set aside at room temperature for ten to twelve days. The last plate or two of the series will be found to show isolated colonies of trypanosomes which can be transplanted in the usual way to the test-tube. This method will undoubtedly be found useful in future studies of the flagellates found in the intestinal canal of insects and other sanguivora. The intestinal contents can be spread directly over the plates in the manner indicated.

THE VOGES-PROSKAUER REACTION AGAIN. In connection with the discussion of the Voges-Proskauer reaction in the last number of this Journal it might be added that Harris of the University of Chicago has recently tested this reaction very carefully and reports as follows:*

The red coloration at times met with in fermentation tubes after testing the gas composition with KOH solution, was first described by Voges and Proskauer in 1898 as occurring in fermentation tube cultures of certain members of the hemorrhagic septicaemia group of bacteria, and the reaction was advocated by them as a test for differentiating members of this group. However, as proposed by them, the test is without value, because their observations were made on bacilli which we now clearly recognize as belonging to the hog cholera group, not to the hemorrhagic septicaemia group.

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*Ann Arbor Meeting of the Society of American Bacterioligists.

The color reaction has since been proposed by Durham and MacConkey as a differential test whereby B. lactis aerogenes, B. mucosus capsulatus (Pfeiffer), and B. cloacae and bacteria of such types may be distinguished from certain intestinal and other forms of bacteria. Howe and MacConkey likewise recommend it as possessing value in the bacteriological analysis of water.

Contrary to the views of the foregoing observers, the writer finds that the reaction occurs irregularly with such bacteria as B. coli, B. lactis aerogenes, B. mucosus capsulatus (var. Pfeiffer, and Friedlander), B. cholerae suis, B. enteritidis, B. icteroides, B. paratyphosus (several races), B. proteus vulgaris, B. cloacœ, B. fæcalis aligenes and B. typhosus and Streptococcus pyogenes.

Conclusions:

1. By Voges and Proskauer the reaction was obtained not with any member of the hemorrhagic septicaemia group of bacteria, but with one of the hog cholera group.

2. The writer finds that the reaction is not confined to any one particular group of bacteria, as found by Durham and MacConkey, but occurs widespread and irregularly amongst bacterial species.

3. As a differential test, the Voges-Proskauer reaction is of little value.

4. Its nature is at present unknown.

STANDARDIZATION OF ANTITETANIC SERUM. At the recent meeting of the Society of American Bacteriologists a committee was appointed, consisting of Doctors Kinyoun, Houghton, Park, Theobald Smith, Pease, McFarland and Rosenau, to take the matter of standardization of antitetanic serum into consideration, and to confer with other committees having this matter in hand, and to report at the next meeting of the Society. This committee was the result of a discussion following the reading of a paper on this subject by Dr. E. M. Houghton. Dr. Houghton's conclusions are as follows:

"Experience has shown that the Ehrlich test for determining the strength of anti-diphtheric serum is very reliable, and has been adopted by the U. S. Department of Public Health and Marine Hospital Service as a method of standardizing this serum. Many methods are employed for measuring the strength of antitetanic serum, but none have been generally adopted in this country. The results of laboratory tests indicate that the sera found on the market vary enormously in strength, as tested by the modified Behring method. It would seem desirable that a method be adopted for testing antitetanic serum similar to that in use for determining the strength of anti-diphtheric serum, but it seems to the writers that the test animals should be guinea-pigs and that the units of strength should be such that a curative dose of ten cubic centimeters of antitetanic serum would contain approximately the same number of units as the curative dose of anti-diphtheric serum, as recommended by the U. S. Pharmacopeia."

ISOLATING PNEUMOCOCCI FROM MIXED CULTURES. Starting with Hiss's demonstration that pneumococci ferment inulin while streptococci fail to ferment it, Ruediger* has prepared a blue litmus inulin-agar medium in which the pneumococci form red colonies. This medium is composed of sugar-free agar with the addition of litmus and inulin and is prepared as follows:

(a) Peptone (Witte), 10; agar, 15; sugar-free beef broth (neutral), 1000. Dissolve by boiling one hour, adding water from time to time. Heat in the autoclave for fifteen to twenty minutes (to prevent subsequent precipitation while sterilizing), clarify with egg and filter through cotton, making the volume up to 800 c. c. with distilled water.

(b) Dissolve 15 grams of pure inulin in 200 c. c. of boiling distilled water and add this solution to (a). Now add 20 c. c. of a five per cent. solution of litmus (Merck's highest purity) and tube, putting 7 to 8 c. c. of medium into each tube. Sterilize in the autoclave under ten pounds of pressure for fifteen minutes. As some pneumococci do not grow well in this medium it is necessary to add 1 c. c. of heated ascites fluid or serum to each tube of melted agar (which has been cooled to 45 degrees), immediately before using. In this mixture the pneumococci grow well and form red colonies in twenty-four to seventy-two hours.

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*Journal of Infectious Diseases, January, 1906.

Ruediger has shown further that pneumococci are practically the only mouth bacteria that ferment inulin. It is not fermented by streptococci (Hiss), staphylococci, pseudodiphtheria bacilli, Micrococcus catarrhalis, Micrococcus tetragenus and Bacillus mucosus. Among ten cultures of diphtheria bacilli was found, one which fermented inulin. Twenty-two cultures which were made from red colonies in plates that had been inoculated with material from throats of pneumonia and scarlet fever patients were studied in detail. All are Gram-positive cocci which grow chiefly in pairs on blood agar slants, but some also form chains in liquid media. All ferment inulin and all but four form green colonies in blood agar plates. Capsules could be demonstrated on more than half of the cultures.

PREVENTIVE THERAPEUTICS.

By Herbert D. Pease.

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STANDARDIZATION OF TETANUS ANTITOXIN. At the recent meeting of the Society of American Bacteriologists held at Ann Arbor, Mich., a committee of that Society was appointed to consider the formulation of a standard test for estimating the strength of tetanus antitoxin. This committee was instructed to co-operate with any other committee or institution considering the subject. The membership consists of Dr. J. J. Kinyoun, chairman, and Doctors E. M.

Houghton, Joseph McFarland, W. H. Park, H. D. Pease, M. J. Rosenau and Theobald Smith.

INTRAMUSCULAR INJECTIONS OF ANTITOXINS. Meltzer and Auer* show that the absorption of certain substances at least, such as adrenalin, curare and morphine, takes place far more rapidly when they are injected directly into muscular tissue than into the subcutaneous tissues.

While the effect of these injected substances was not produced quite as rapidly by intramuscular as by intravenous injections, the difference in time between these methods was not nearly so great as between the intramuscular and the subcutaneous.

These results are undoubtedly applicable to other substances, such as antitoxic serums, and as the time element in beginning the treatment of diphtheria and tetanus is of the utmost importance it is strongly recommended that antitoxin be injected directly into muscles rather than subcutaneously. This latter method frequently results in the injection being made into adipose tissue, from which absorption is exceedingly slow. The intramuscular injections are not more painful, but, on the other hand, are, as a rule, much less disturbing than the more superficial.

ANTITOXIN TREATMENT OF DIPHTHERIA IN NEW YORK CITY. Billings† has summarized the results of the use of the diphtheria antitoxin prepared by the New York City Health Department Laboratory for ten years. His tables show that the mortality from diphtheria has been reduced 200 per cent., and the number of deaths in proportion to the total inhabitants 100 per cent. The latter he considers the more reliable index of the actual reduction in the mortality due to antitoxin treatment.

Moreover the results during the last three years are far better than those obtained during the first three years of the use of antitoxin, the number of deaths being 20 per cent. less in the former, although the number of cases was doubled.

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*Meltzer and Auer. Journal Experimental Medicine, 1905, 7, 59.

†Billings. New York Medical Journal, 1905, 82, 1310.

Recently, 90 per cent. of the laryngeal cases has been saved, and the number of cases of the laryngeal type of the disease has been greatly lessened.

The mortality in the 10,557 cases (moribund cases excluded) treated by private physicians during the ten years was 8.3 per cent., while that for the 3547 cases treated by the Health Department inspectors was 4.0 per cent.

The day of the disease on which the first dose of antitoxin was given by the city inspectors is shown in tabulated form.

DAY OF DISEASES.

	1st	2nd	3rd	4th	5th	Over	Not Stated	Totals
Cases	503	1349	1035	380	141	178	32	3618
Deaths	8	38	48	58	28	33	1	214
Mortality	1.5%	2.8%	4.6%	15.2%	19.8%	18.5%	3·1%	5.9%

This is a most striking demonstration of the value and necessity for the early administration of antitoxin. The total mortality in 18,866 cases was only 7.3 per cent.

Immunizing doses were given to over 46,000 persons by the inspectors, and nearly 6000 by physicians. Of these only 120 (less than .25 per cent.) developed diphtheria after the first twenty-four hours and before the end of thirty days.

THERAPEUTIC VALUE OF ANTITOXIC ELEMENT IN SERUM. Cruveilhier,** in company with other French writers and clinicians, believes that all the valuable therapeutic elements in diphtheria antitoxin are not represented by the tests showing the number of antitoxic units in the serum. His experiments made on guinea pigs, which received uniformly fatal doses of cultures of diphtheria bacilli followed by equal quantities of antitoxic serums of various strengths, showed that in many cases the weaker serums, so far as antitoxic units were concerned, gave as good curative results as the more concentrated serums. The same held good when the serums were used as prophylactic agents and injected prior to the fatal culture injections, that is, the

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**Cruveilhier. Annales de L'Institut Pasteur, 1905, 19, 249.

serums of weaker unit strength were usually as efficient as the more concentrated serums in equal amounts.

ARTIFICIALLY CONCENTRATED DIPHTHERIA ANTITOXIN. Gibson* has succeeded in concentrating diphtheria antitoxin three or fourfold by the use of chemical procedures. The serum albumen and the water insoluble globulins and certain nucleo-proteids in antitoxin serum are separated from the so-called soluble globulins with which the antitoxic principle is identified or associated.

The final product sterilized by antiseptics and filtration is clear and colorless or slightly tinged with haemoglobin, and from Gibson's tests maintains its power as long as the original serum does. The concentrated serum has been used in New York city for several months and has given excellent results. A decreased tendency to the severer forms of the so-called serum sickness, skin eruptions, joint pains, etc., has been noticed, and this decrease, together with a lessening of the bulk of liquid to be injected, will tend to increase its popularity.

IMMUNIZATION THROUGH THE FEEDING OF MILK OF IMMUNIZED ANIMALS. Salge†, who had previously shown that antitoxin when fed to infants in the form of serum taken from animals did not pass into the circulation from the intestinal canal, but was so absorbed when present in the feedings of mothers' milk, endeavored to ascertain whether the antitoxin antibodies in the milk from goats artificially immunized to diphtheria and typhoid fever would be absorbed into the circulation of infants fed with such milk.

His results were altogether negative, the antitoxic and specific bactericidal substances were not absorbed from the infant's intestinal canal. It would appear from this work that the plan of feeding to infants the milk of cows artificially immunized to tuberculosis devised by Behring would be unsuccessful.

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*Gibson. Journal of Biological Chemistry, 1906, 1, 161.

†Salge. Jahrbuch fur Kinderheilkunde, 1905, Band 11 (3rd Series) p. 486.

VETERINARY SANITATION.

By Veranus A. Moore, M. D.

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THE SERUM DIAGNOSIS OF GLANDERS. The doubt that still exists in the minds of many concerning the diagnosis of glanders with mallein, especially in horses that have been exposed, but which show no physical signs of the disease, renders the serum, or agglutination method a matter of unusual interest. The prevalence of glanders in many places, the value of the animals exposed, and the seriousness of the disease for both horses and men are sufficient to arouse interest in any method for making a positive diagnosis, as well as means for its eradication. The work recently published by Schutz and Miessner† is worthy of consideration.

The authors made extensive investigations to determine the value of the agglutination method in the diagnosis of glanders.

The experiments were made with glanders bacilli, which were killed by exposing them for two hours at a temperature of 60 degrees C., and then emulsified with a carbolized solution. To 2 c. cm. of this emulsion, the blood serum of the suspected animals was mixed in various quantities. The mixture was then placed in an incubator and kept at 37 degrees C. temperature for 24 to 30 hours. The results of these experiments were, that while the blood serum of horses free from glanders agglutinated the bacilli at the most in proportions of 1:400, those of glandered animals as a general rule produced a reaction in proportions of 1:1000 to 1:2000. The blood serum of horses artificially infected with a virulent culture gave a reaction beginning on the fifth to seventh day from the time of infection, which increased in the following four or five days (in one case to 1:8000), and then remained at that height for about one month. After that time, it gradually diminished (to 1:800 to 1:400). According to this, with the agglutination method an infection of glanders can be determined which occurred eight to fourteen days previous to the test. From a practical standpoint this is of great value for retesting the horses in stables where already infected horses have been destroyed; the test is to be made two to three weeks after, and in this way the new infection can be determined by the reaction. Two experiments lead to the result that previously injected mallein has no effect on the agglutination. The blood serum of horses free from glanders has not agglutinated the cultures in higher proportions than 1.800, while in those affected with pneumonia or pleurisy the proportion even reached 1.1000. In the Pathological Institution of Berlin, in two years, the blood serum of 2,209 horses has been examined with the following results:

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†Archiv fur Wiss u. Prak. Thierheilkunde, August 1905.

Of 1,911 horses free from glanders, in 1,232 or 64.8 per cent. the blood serum agglutinated 1:100—1:300; in 363, or 19.0 per cent. the blood serum agglutinated 1:400; in 135, or 7.1 per cent. the blood serum agglutinated 1:500; in 123, or 6.4 per cent. the blood serum agglutinated 1:600; in 41, or 2.2 per cent. the blood serum agglutinated 1:800; in 11, or 0.5 per cent. the blood serum agglutinated 1:1000; while a reaction higher than 1:1000 could not be observed in a single case.

Of 298 glandered horses, in 6, or 2 per cent. the blood serum agglutinated 1:400; in 12, or 4 per cent. the blood serum agglutinated 1:500; in 44, or 14.8 per cent. the blood serum agglutinated 1:600; in 47, or 15.8 per cent. the blood serum agglutinated 1:800; in 75, or 25.2 per cent. the blood serum agglutinated 1:1000; in 49, or 16.4 per cent. the blood serum agglutinated 1:1500; in 65, or 21.8 per cent. the blood serum agglutinated 1:2000.

These uncertainties in the agglutination are somewhat reduced by the fact that the smaller proportions in the agglutination are, as a general rule, in such horses as are affected with a severe and extensive form of the disease; further, that in glandered horses, the agglutination power of the blood serum is with the passing of time gradually diminished in the way that from the tenth to eleventh day following the infection, for a month it corresponds to 1.2000, then from two to three weeks it drops to 1:500 1:1000 1:800, 1:600, 1:500; while, on the other hand, in horses free from glanders, the agglutination power of the blood serum does not change. The authors applied the agglutination method in numerous cases in practice and based on their experience they recommend the following method for the diagnosis and eradication of glandered horses:

1. From 20 to 50 cubic centimetres of blood is taken from the glandered or suspected horse, the bottle is carefully marked and accompanied with the history and other data regarding the infection, etc., is sent to the experiment station.
2. All horses of which blood serum agglutinated in porportion of 1:1000 or higher should be destroyed.
3. The same way all horses should be destroyed of which the blood agglutinates only in proportions of 1:500—800, but otherwise show the clinical symptoms of glanders.
4. All other horses in which the agglutination occurs in dilutions of from 1:500 to 1:800, should be isolated and only destroyed in such cases, when justified, by a second test, at which the proportion of agglutination changed or diagnostic symptoms develop. If they do not react at the second test they may be pronounced free of glanders.
5. After establishing glanders, the blood of horses in the same stable should be tested after three weeks, and this should be repeated as often until the last two tests show in all horses individually a uniform reaction.

THE SPREAD OF BOVINE TUBERCULOSIS.—A very clear warning was sounded at the Eighth International Veterinary Congress in Budapest, last September, relative to the spread of tuberculosis in cattle. The feeling seems to exist that because it is a disease of slow development that it is not rapidly disseminated. Dr. Regner of Stockholm pointed out the fact that during the year 1904 tuberculosis had found its way into 52 dairies where it did not exist the year before, and that 5.9 per cent. of the cattle were infected. This is an important observation, and one which should inspire renewed efforts to those entrusted with the control of tuberculosis in cattle in this country. The fact that in certain and quite widespread localities there is a large percentage of dairy cattle affected with tuberculosis is a sure indication that the disease is spreading rapidly to the uninfected animals.

THE PROPHYLACTIC VALUE OF TETANUS ANTITOXIN.—It is a well-established fact that tetanus in both man and animals is quite prevalent in certain localities. The loss of animals, especially horses, from this disease is, in these infected localities, very considerable. In order to overcome this, tetanus antitoxin is being used more and more as a prophylactic. When animals are injured in such a way that infection with tetanus is liable to occur, or when they are to be subjected to an operation, (such as castration,) they are treated with immunizing doses of tetanus antitoxin. The demand for tetanus antitoxin for this purpose is increasing very rapidly, especially in France. This is shown by the fact that in 1896 there were sent out from the Pasteur Institute of Paris 1,511 bottles containing 10 cc. each; in 1898, the number was 24,950, and in 1900 it exceeded 43,000 bottles. It is given hypodermically, in two doses, from 10 to 12 days apart. The immunizing dose for large animals is 20 cc., and for small ones from 6 to 10 cc. The method is being used with good results by many veterinarians in this country.

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AMERICAN JOURNAL OF PUBLIC HYGIENE
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THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH was organized in Boston, March, 1890, *with the following objects: The advancement of sanitary science; the promotion of better organization and co-operation among local boards of health, and the uniform enforcement of sanitary laws and regulations.*

THE JOURNAL OF THIS ASSOCIATION has for fifteen years faithfully reflected the views of the public hygienists of Massachusetts. With the November issue of the year 1904, *the encouragement received from many hygienic quarters induced the Association to undertake the expansion of the Journal to a national standard, with the co-operation of many noted sanitarians as editors. A new title was selected, while the older and well-established title was retained also.*

The dates of publication are FEBRUARY, MAY, AUGUST and NOVEMBER of each year.

THE JOURNAL will contain the papers read at the meetings of the Association, papers contributed by hygienists, report of the discussions, editorials, abstracts, reviews and hygienic notes of professional interest. Subscription rates, $1.00 *per year. Reprints furnished at cost price.*

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All communications concerning the ASSOCIATION should be addressed to the Secretary of the Association, JAMES C. COFFEY, CITY HALL, WORCESTER, MASS.

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APRIL QUARTERLY MEETING
OF THE
Massachusetts Association of Boards of Health

The quarterly meeting of the Association was held at the Brunswick Hotel, luncheon being served at one p. m. After the luncheon the exercises were as follows, Dr. H. P. Walcott presiding.

THE CHAIRMAN: Gentlemen, the meeting will please come to order. Will the Secretary read the records of the last meeting?

(The Secretary read the minutes of the last meeting.)

THE CHAIRMAN: Is there any change to be made in this record? If not, it will stand as the record of the last meeting of this society. The Executive Committee recommend to the society the election of the following persons:

Dr. Chas. F. Atwood, Arlington.
Dr. James J. Scannell, Boston.
William H. Hayes, Boston.
Dr. Geo. Westgate Mills, Medford.
Dr. Frederick R. Ilsley, Medford.
Geo. Royal Pulsifer, Newton.
Miss Elizabeth S. Mason, Smith College, Northampton.
Miss Evelyn B. Sherrard, Wellesley College, Wellesley.
Miss Elizabeth A. Wright, Radcliff College, Cambridge.
Miss Mary E. Trueblood, Mt. Holyoke College.

Is it your pleasure that these persons be elected to membership in the society? If so, you will indicate it by saying "Aye."

(Response, "Aye.")

Contrary minded, no. They are duly elected. Is there any business to come before the society at this time? If not, the first paper upon our programme is a paper upon "The Gypsy and Brown-tail Moths; Their Life Histories and Some Suggestions for Their Suppression," by Prof. William Lyman Underwood. Mr. Underwood hardly needs an introduction to this audience.

SOME PERSONAL EXPERIMENTS WITH THE GYPSY AND BROWN-TAIL MOTH PESTS.

Prof. William Lyman Underwood.

Mr. President and members of the Association: One can scarcely pick up a newspaper nowadays without seeing in it some reference to the gypsy and brown-tail moth plague, as I may term it,—two pests which in this section of Massachusetts have made life at certain times of the year almost, if not quite, unbearable. In spite of all the information which has been published on this subject there are many people who do not know the difference between the brown-tail moth and the gypsy moth. They don't know really what these insects are capable of doing; they don't know about their life histories. Many persons do not seem to pay much attention to the subject; they wait until the brown-tails or the gypsies get upon their own places or upon their trees and strip the foliage and then they begin to look into it. I can speak quite feelingly on this matter because I was one of that class of people myself. I didn't pay very much attention to this question. I live in Belmont where for many years we did not have any gypsy moths, but last year we began to have them quite plentifully and in order to protect my own trees, of which I have some three hundred, I had to inform myself on the subject. I am going to tell you this afternoon what I found out in a small way and try to give you some information whereby those of you who have small places can look after your own trees and perhaps can tell others how to take care of theirs.

Now, if you will have the lights put out I will show the photographs which I have taken to illustrate my points. I shall first take up the gypsy moths.

If one walks out through an infested district in the fall or during the winter or even now, he will see on the trees something like this. These are the egg clusters of the gypsy moth; unless it is a very thickly infested section, you will not see the clusters as close together as these are. They are generally on the under side of limbs, out of the sun, for the moths and the caterpillars do not like the sunlight and always seek the shade. Each of these clusters contains from two to four or five hundred eggs. They are just this yellow color when they are laid, but later on, especially if the sun beats upon them, they will change in color and become faded out to a dirty white, especially at this time of year. Now, we will examine more closely one of these egg clusters. In reality they are about an inch and a half long, covered with creamy yellow hair, which the female puts upon each of the eggs as she lays them. The eggs are covered with a sticky gelatinous substance, to which the hairs readily adhere. We will take a knife and scrape away the surface of one of these clusters and then you can see the individual eggs closely packed together with the hairs which are taken from the body of the female sticking to them. In reality these little eggs are about the size of the head of a pin and are of a pinkish color. As I said, each egg cluster contains on an average from two to three or four hundred eggs. No matter how cold or severe the winter, unless these egg clusters have been properly treated, when this time of the year comes or a little bit later, they will begin to hatch out. Last year (1905) I saw the first caterpillars crawling about on the 22nd of April.

If you should walk along by a pasture wall through an infested district you at first would not notice many egg clusters, owing to the fact that the caterpillars have crawled in under the wall and pupated and the moths have laid their eggs out of sight in the shade. But pull out a stone and turn it over and this is what you would probably see—great numbers of egg clusters covering the stone. This was the under side of the stone before I pulled it out, and many of these other stones in the wall were in the same condition, having a great many egg masses upon them. Any one going along and taking merely a superficial examination would not have seen them. Now, a stone wall is a pretty hard thing to treat. Of course, the best thing to do is to point it, fill it up with cement, but that is an expensive job and there are not many farmers who can afford to do it. The next best thing is to sell the stone and that can be quite easily done in this section because the stone is valuable. By putting up wire fences instead of stone walls the farmer can easily overcome this difficulty, for the moths will not lay their eggs upon wire fences. If, however, you do not want to get rid of your wall and you cannot cement it and don't want to sell it, the next best thing is to wait until about this time of the year, or a little later, when the caterpillars begin to crawl out, and then set fire to the grass around the base of the wall and blow a flame of gasolene or kerosene into all the openings. That will kill the little caterpillars very readily. If you were to hold a torch under one of these egg clusters for quite a while you would not do very much damage. After a few minutes you would hear some of the outer eggs pop, as they expanded with the heat, but those of the inside of the cluster would not be affected. But by waiting until the caterpillars crawl out they can be very easily destroyed. Mr. Kirkland has told me of another way of destroying the caterpillars on stone walls, but he will speak about that when he tells you of his larger field work.

The caterpillars go into all sort of out-of-the-way places where they pupate. You will find them in old tin cans out on the dump; they will crawl up the spout of a rain water conductor; they will get under the eaves, under the piazza, and into all sorts of places. This picture shows you one out-of-the-way place where some of them crawled. It is an old-fashioned New England iron kettle, one of the kind where the cover swings off to one side and does not tilt back. The caterpillars had crawled in through the spout, and the mother laid their eggs in there, and you can see along the edge where the eggs of the moths were laid and where they were torn away when the lid was pulled off to one side. There were thousands and thousands of eggs in that kettle, and if they had not been discovered great numbers of caterpillars would have crawled out the next spring. To give you a further illustration to show where the moths and caterpillars may go and in what strange places we may find them, I had a good deal of trouble in persuading these insects to keep still while I took their picture. In making some experiments with them I had a member of my family to assist me and he was trying to devise some way to make the moths keep still while they were having their pictures taken. He had one particularly fine specimen of gypsy moth which got away from him. That night after retiring he felt something uncomfortable under his collar, and on investigating he found this individual moth. After he had removed the moth he returned to bed, but still felt uncomfortable, and upon further investigation found quite a number of eggs which the moth had laid adhering to one of his shoulder blades. Still further than this, I had occasion one day to consult a volume which was published by the Gypsy Moth Commission—and a very excellent volume it is—on the gypsy moth problem. It was in a bookcase, and when I took the volume down I was astonished to find on the top of it a gypsy moth chrysalis or pupa. The caterpillar had apparently, in defiance of the Commonwealth of Massachusetts, crawled up the back of this book and pupated on the top of it. A number of times afterwards we found pupae and moths in out of the way places through the house.

This picture shows you the little caterpillars as they are coming from the egg clusters in the spring. It was taken on the 22nd of last April, the first day that I saw them out. I believe that in some warm places this year the caterpillars have now begun to crawl from the eggs. It makes no difference how cold the winter may be, they will come forth in the spring if the clusters have not been treated as they ought to be with creasote. These little caterpillars do not eat very much for a few days. They stay around the places where they have been born, and then they begin to go out on the foliage. When they are small they are not so very ravenous. They eat only the tender hairs and outer skin of the leaves at this age. In this photograph, taken on June 5th, the caterpillars are half an inch long, and are not very prominently marked. They are of a dirty grayish color, with long black hairs and a rather large head. As they grow they shed their skin or moult five or six times until they come to their full size. From now on they increase in size much faster, and here we see the full-grown caterpillars upon an elm leaf. They are now about three inches long, and can be easily distinguished from the other caterpillars by this double row of red and dark blue spots. Beginning at the tail, there are six rows of red spots and five rows of blue spots. There is no other caterpillar in New England which has this double row of red and blue spots. At this stage they eat about everything they come across. All foliage is good food to them.

After a short time, when they are full grown, they change from the caterpillar or larva into the pupa or chrysalis. They begin to thicken up a little, they get shorter and thicker, and spin a few threads of silk, by which they hang, from the tail, and now they begin to twitch and soon split here at the shoulder and the pupa comes out. At first it is of a delicate pink color, but it soon changes to a brown—to different shades of brown, and sometimes almost black. Here you see an empty caterpillar skin, and this is the pupa. There is some difference in size among the pupae, but as a general thing the larger ones are the females and the smaller ones are the males. Here as the pupae they stay from eight to ten or fourteen days, aocording to the temperature. If it is warm, the process will be hastened, but if it is cold it will be prolonged. Then from the chrysalis or pupa the moth emerges.

In this picture we see a large group of moths upon a limb of an apple tree, and there were many limbs on many trees on this estate which looked like this. The farmer who owned this place—and it was right across the street from my home —was a newcomer into this section of Massachusetts. He saw these golden egg clusters on the trees in the fall and he knew something had got to be done, so he got a hoe and hoed them down and he did what he thought was a pretty good piece of work. He scraped all the egg clusters off on to the ground and thought that he had done away with them. Much to his disgust and astonishment, the following year there were ten times as many caterpillars and gypsy moths about his place as there had been the year before. Of course, his work was thrown away. He had merely hoed them down onto the ground, where the eggs hatched out nearly as well as if they had been on the trees.

All the moths in this picture are females, and most of them are beginning to lay their eggs, as you see. Here are the empty pupa skins from which they have crawled. The next picture shows us the gypsy moths a little nearer and a little larger. They are just this creamy yellowish color when they come from the pupa, although this color may change quite rapidly if the sun shines upon them. Here is one which has faded out considerably, showing it has been longer in the sunlight than the others.

The female moths crawl but very few inches away from the place where they have been born. The females cannot fly, and it is owing to this fact, that in the nearly forty years that they have been here they have not spread over a much larger territory than they have. This moth came from this chrysalis here, just about an inch away, and here is the chrysalis from which this moth came.

This picture might be a little misleading because it shows gypsy egg clusters upon leaves. This rarely occurs. They do not very often lay their eggs upon the foliage, but generally on trees or upon fences, and in secluded places out of the sun. Let me stop a moment just to call your attention to this brown-tail moth and show you how different it is from this gypsy. It is much smaller and it pure white; but I will call those points of difference to your attention in some other pictures later on.

This shows you a photograph taken on the top of Arlington Heights about two years ago. Last year the condition was even worse than this. As far as you could see, looking towards Winchester and Burlington, there was scarcely a leaf left on the trees. All of the deciduous trees and many of the conifers or evergreens were completely stripped. About a quarter of a mile below this place was a large patch of poison ivy, and even that was stripped of its leaves. The deciduous trees can generally stand having their foliage eaten for several seasons. Sometimes one season will seriously injure them, but if the soil is good they may be stripped time and time again before they are killed. On the other hand, if an evergreen or coniferous tree is once thoroughly stripped, it will not recover. There were many pines in this locality that were stripped and killed. The caterpillars do not care particularly for the white ash, and here is a white ash tree which you see still has a little foliage upon it, but later it, too, was eaten off. Here is a spruce hedge in the town of Medford, which has been stripped, it isn't good for anything except for fire-wood. The photograph was taken last August. A year ago at this time it was a very fine hedge, but now its beauty has gone, never to return. The foliage had also been stripped from these maple trees and from the apple trees, but you see it has come out again.

The thing to do with these egg clusters—the thing to have done, for it is too late to do it now—is to cover them with some substance which will prevent the eggs from hatching. The best thing to use is creosote oil, which can be bought for 35 cents a gallon, if it is purchased in large quantities. It should be applied to the egg clusters with a stiff brush, preferably a stencil brush which has good stiff bristles. An ordinary paint brush will hardly do. Sometimes I have seen people take a paint brush and paint over the egg clusters. That will kill the eggs on the outside, but not on the inside.

The material must be rubbed in. You can readily tell what nests have been treated with the oil, because after it has been applied they turn black. The oil should be applied just as soon as the foliage goes off in the fall. Of course, it can be done any time during the winter, but it is better to have the work done before the snow comes.

If you have treated your place properly and applied the creosote faithfully to all the egg clusters and later on when the caterpillars begin to crawl, they come over to your place from some neighbor who has not done the work which he ought to do, you can keep them from going into your foliage by putting around the trees some sticky preparation. In order to apply the preparation it is necsssary to get a smooth surface on the bark of the tree, and great care should be taken not to scrape the bark too deep, or the tree will be injured. Some trees like the birch or the beech may not need to be scraped at all, because the bark is smooth enough. There are several substances on the market which are used for this purpose and some of them are distinctly injurious to trees. There is one material which I have used with good results—last year I applied it to two hundred trees and I shall put it on three hundred trees this year,—and that is "Tanglefoot." In the Middlesex Fells last season the Metropolitan Park Commission used something over two tons of this substance and banded over sixty thousand trees. This year they will use over ten tons of it. "Tanglefoot" is the same material that is put on sticky fly-paper, but for moth destruction it comes in bulk in cans. It costs twenty-five cents a pound at retail, or it can be bought at a less price if you buy large quantities. It comes in five, ten or 25-pound cans. You can take it from the cans and put it on a mortar board, and then with a wooden chisel or trowel, put it on the trees. The caterpillars, both of the brown-tail moths and gypsy moths, cannot climb over this material. They do sometimes get over it in badly infested districts. I have seen the trunks of the trees so thickly covered with caterpillars that you could scarcely see the bark. In such a case, when the caterpillars are so crowded, they may crawl onto and stick to the band and over their dead bodies the other caterpillars will crawl, just as the Japanese did in storming Port Arthur, and eventually they will get up the tree. But that is only in rare cases. Where they are so thick as this if we spray them with kerosene or gasoline in a fine spray they can be killed by the thousands and will drop to the ground as though struck by lightening. The "Tanglefoot" should be put on now, before the caterpillars begin to crawl.

This picture shows you the good effect of "Tanglefoot." It was taken out in Middlesex Fells. On this side of the road you can see the trees are perfectly protected and the foliage is in good condition. The trees on this side have not got a leaf on them. Nothing was done to them except what was done by the caterpillars, and they did their work very well, as you see.

There is still another way to protect your premises from these caterpillars,—a way which was adopted last year out in Middlesex Fells. In certain sections there, where they wanted to keep the caterpillars out, they put on the ground this windrow of hay and kept it saturated with crude kerosene. This fringe of hay was two miles long, and they had altogether some four miles which was kept wet with kerosene. Not a caterpillar of either variety can crawl through it and live. Sometimes they may squirm out for two or three feet, but they are sure to die, after a drop of oil has touched them.

There is still another way by which you can rid your premises of the caterpillars, and that is by spraying. Until last year I thought—in fact, it was commonly supposed—that there wasn't much good in spraying for full-grown gypsy caterpillars, because they seemed to grow fat on everything that was used. They did on Paris Green, so I was told. The farmers who sprayed with Paris Green did not seem to get very good results. In the last part of July I came home, after a three weeks' absence, and I found my hemlock hedge, about three hundred feet long and seven feet high, looking ragged and thin. On close examination I found that it was full of gypsy caterpillars. I thought I had gone over my grounds very thoroughly during the winter, but when there are many egg clusters in a hedge like this it is hard to get them all. I creosoted many hundreds of them in the hedge, but it seemed there were quite a number left. We didn't know what to do. We picked off something like six hundred in less than half an hour, and then gave it up as a bad job. I telephoned to a forester and entomologist whom I knew and asked if there was anything that could be done. He said that two months ago he would have told me that it would be a pretty hard thing to save the hedge, but lately he had been using a preparation of arsenate of lead with good success. To make a long story short, he came over and sprayed the hedge, using arsenate of lead, fifteen pounds to 100 gallons of water, and for $1.80 the hedge was saved. In three days there wasn't a live caterpillar on it. Arsenate of lead makes a white deposit on the leaves which readily adheres to them, and although this hedge was sprayed on the 3rd of July you could still see some of it during last winter. Even if it should rain within two or three hours after spraying, the rain would not wash it off, as is often the case with Paris Green. Arsenate of lead is not a desirable thing to have near any food material, and if you have any fruit or vegetables near by it is well to cover them up before spraying. This preparation should be put on as a thin spray, just as near a fog or mist as you can get it. It is better to begin at the top of the trees and let the wind gently blow it on the foliage. Stop spraying as soon as it begins to drop off the leaves as then you are losing your material. On an average, this work can be done at about one dollar for each full-grown elm tree.

Here you may see the good effect of spraying. Here is a gentleman's estate where the trees were sprayed some four weeks before I took this picture, and if you were near enough to examine it closely, you could still see some of the deposit on the trees. As you see, the foliage is in fine condition; it is not harmed in any way.

No wonder that this adjoining estate was "For Sale"; there was not a green thing left on any of the trees. The other day I went by this place and found that they had cut all these trees down.

Many of you may have wondered what these curious burlap petticoats were which you have seen on the trees when you have gone out through a district where there were gypsy moths. I used to think that, in using these burlaps, all one had to do was to put the material around the tree and in some mysterious way it kept the caterpillars from crawling up; but there is considerable work necessary in connection with the use of the burlap. The cloth comes in strips about eight or ten inches wide. You put a piece around the tree and tie it on, then pull the top fold down over the string, and it forms a very excellent hiding place during the daytime for the gypsy caterpillars. The caterpillars feed almost entirely by night. As soon as the sun goes down they crawl up in the trees and get out on the foliage and begin to eat. As the sun rises in the morning they come down and seek the shade. If it is a cloudy day and warm they will sometimes stay up in the tree and eat during the morning, but they generally come down soon after sunrise. When there are burlaps on the tree many of the caterpillars will crawl under them, and here they can be killed. I have been told—and my own experience bears it out—that if these burlaps are well tended, you will get nearly ninety per cent of the caterpillars in the tree. Of course, they will not all come under it the first morning, because many will hide beneath the limbs, but eventually, if the burlaps are tended and turned up each day and the caterpillars killed, you will get about all there are in the tree. It is necessary to put these burlaps above the "Tanglefoot," should there be any on the tree, otherwise the caterpillars cannot crawl down to hide under it.

Now, we will lift up the burlap and you will see underneath it lots of caterpillars. They can be exterminated if their numbers are not very large, by cutting them with a knife. It is not a very pleasant task. If they are present in large numbers, it is a long operation to cut each one individually with a knife. Under these circumstances, wire brushes should be used for extermination, made with stiff wire bristles; when one of these bristles goes through a caterpillar it may not kill it or prevent it from crawling away, but it will not transform and become a moth and lay any eggs. It is important to attend to these burlaps. They should be looked at every day or every other day at the longest. They should be taken off in the fall and not left on the tree. If you leave them they will invite other insects, notably some of the borers which puncture the bark and kill the tree. It is no economy to try and use these bands a second year.

This burlap was left undisturbed for five days and then turned up, and here is what I found,—hundreds of caterpillars ready to transform into pupae. Here we see a full grown gypsy moth, and, by the way, the moth, in the case of both of these insect pests, does no damage beyond laying its eggs and preparing for future generations. They do no eating, neither the brown-tail moth nor the gypsy moth. It is the caterpillar in both cases that strips the trees. The moth above is a female. Remember, the female moth does not fly, and it is the female which has this characteristic cream yellow color. We see here the male moth dark brown in color, which flies about very nicely both by day and by night during the month of July.

Now, we will take up the brown-tail moths and caterpillars. The first thing we notice in regard to brown-tail moths is that in the latter part of August we see the foliage beginning to turn brown, as though it had been struck by an early frost. The eggs have been laid in the latter part of June or July, and after the little caterpillars are hatched they begin to eat the outer skin, or epidermis, of the leaves. They soon gather a few of the leaves into nests and bind them together with silken threads which they spin. We do not notice these nests at this time of the year, but they are there, and later on when the frosts come and the other leaves have fallen, they stand out conspicuously.

We will examine one of these nests a little closer. Inside of the clusters of leaves are numerous little galleries or rooms, and in those rooms are the little brown-tail caterpillars. Here they stay all winter as caterpillars,—not as eggs, as in the case of the gypsies. There may be several hundred little caterpillars in one of these nests of leaves. You see them in the top of the trees where they are tied on to the twigs with silken threads. Here is the old egg cluster which was laid during the previous summer. Of course, there is nothing in the egg cluster now; the caterpillars are all inside of the bunch of leaves. No matter how cold it is there they will stay all winter long as caterpillars. If you pull one of the nests to pieces, you will find the caterpillars apparently frozen stiff, but if you take them into the house they will thaw out and begin to crawl. No matter how much snow there is or how cold it is, they seem to be able to survive.

This picture shows the little brown-tail caterpillars as they first come out in the spring. This photograph was taken on the 9th of April last year. When they come out at this time, they are a little smaller than when they went into the nests in the fall, owing to the fact that they have had a long winter's fast and have had nothing whatever to eat. Even at this tender age, if you rub them on your wrist or on any place where the skin is soft and tender, you will get the characteristic brown-tail rash.

The brown-tail caterpillar grows by moulting, just as the gypsy caterpillar does, but it not so large when it is full grown,—about an inch and a half or two inches long. Quite characteristic are these two orange red spots down near the tail and this double row of white spots, one row on each side of the body. The brown-tail caterpillars prefer deciduous trees, although I have been told that they have been eating the leaves of pine trees; but that is rather rare.

We will look at the hairs of this caterpillar, for it is the hairs that cause the brown-tail rash. Many people have an idea that the rash is caused by the bite of the insect, but that it not so; it is simply by the contact with our skin of the hairs which come from the caterpillar and moth. You don't have to touch the caterpillar to get the characteristic poisoning, for the hairs are frequently blown about with the wind. In this way they often get on to our clothing as it is hung out on the line. These litle barbs work into the flesh and we get the characteristic rash. There are other hairs on the caterpillar which have finer barbs, but I will speak of those later. These hairs are highly magnified, of course.

An excellent remedy for the brown-tail rash is bicarbonate of soda. Take a little soda and put a few drops of water with it and rub the paste thus formed on the part that is affected, and generally within ten minutes the irritation will go away, and usually within an hour the rash or the welt will disappear. Many other things can be used, but I have found it to be the best thing in my own case. Cooking soda will answer if you cannot get the bicarbonate.

Here we have the pupa or chrysalis of the brown-tail moth, and almost invariably you will find them on the leaves on the top of the trees. Sometimes when the foliage has been eaten off the trees, the caterpillars will transform on the leaves of the shrubbery. At this stage, the pupa stage, they are very poisonous, owing to the fact that the empty caterpillar skins from which the pupae have come are blown about in the air. Sometimes it happens that there are no leaves on the shrubs or on the trees, because they have been eaten off either by the brown-tail or by the gypsy caterpillars, and in this case we may find the pupae upon fences or the side of buildings. This particular house was almost covered with them. The caterpillars were crawling everywhere, and everywhere you found the pupae. This house was situated in a beautiful location, on the top of a hill not many miles from Boston. I saw the man who was living here. He had been a resident of Boston for some years and wanted to go out into the country for the summer. He found this house offered at a surprisingly low rent, and he could not understand how he could get such a beautiful place, with a fine oak grove surrounding it, at such a low figure. But about the first of June he found out why his rent was so low. The day that I talked with him was the Fourth of July, and and he was not celebrating the day with his accustomed vigor. He was sitting outside the house in a very dejected state of mind. His wife was ill in bed with the brown-tail rash, and one of his children had one eye closed and could scarcely see out of the other. He would have been glad to sub-let at a much lower rate than he paid. On the ground around the walls of his house was a pile of dead caterpillars two or three inches deep. At the foot of all the trees surrounding the house there was the same thing,—hundreds and thousands of dead caterpillars. The place was offensive not only to the eye but to the nose. It fairly reeked with dead caterpillars. You or I would not have cared very much to live in that locality. Adjoining him was a park of eight or ten acres where there were many fine oak trees, and they literally carried the dead caterpillars out of that park in wheelbarrow loads.

One of his neighbors was a little more ingenious and lived in more ease and comfort. He put a band of "Tanglefoot" all the way around his house, across the front steps, up the sides and clear around the building and in a a measure was well protected.

This is the brown-tail moth, and you can see why it is so named. The female has this beautiful brownish tuft of hairs at the end of the tail. The male moth looks almost the same as the female, in size and shape, but it lacks the tuft of brown hairs. Now, I have found in my experience that the hairs of the moth are to be dreaded just as much as the hairs of the caterpillar, for with me they seem to be just as poisonous. One night I was out around the electric lights catching some of these brown-tail moths, and I captured one individual in the back of my neck. That evening when I retired I counted twenty-seven distinct and separate welts as a result, so it was brought quite forcibly to my mind that the moth has something to do with the rash.

The brown-tail moth when it deposits its eggs takes the hair from its tuft on the tail and covers the eggs over with it. Here you see a moth in the act of spinning the web of hair in which is mixed many of its eggs. This is not the normal way in which the insect lays its eggs. This particular moth I had endeavored to kill. I had put benzine upon it and, supposing it was dead, had laid it down upon a box when suddenly it began to lay its eggs. The operation was very interesting to watch. With its two little ovipositors situated near the end of the tail, it pulled out the golden brown hairs which readily adhered to the eggs which are covered with a sticky gelatinous substance when they are laid. You can see some of the eggs here mixed in with the hair. From this mass of hair with some very fine forceps I picked out a little tuft, rubbed some of it on my wrist and got the characteristic brown-tail rash; and some of the hairs I put under the microscope and got the photograph which you now see upon the screen. These hairs are much finer barbed than most of those which are upon the caterpillar, although the caterpillar itself does have hairs which very much resemble and may be identical with these. They are called the nettling hairs.

Here we see the moths laying their eggs in their normal way, which takes place in the latter part of June or early in July. We seldom see the egg clusters because of the fact that they are usually up in the top of the trees. The egg cluster is not as large as that of the gypsy moth, and is of a different color, reddish brown. They are only a few weeks in hatching, and they do not last over the winter as in the case of the egg clusters of the gypsy moth.

This picture shows a mass of brown-tail caterpillars vainly trying to get up over the "Tanglefoot." The winter before last I went over my place very thoroughly and my men went over it afterwards, and then I went over it again, and we thought we had gotten rid of every brown-tail nest, but there was one tree that somehow we must have missed, for the following spring it was filled with caterpillars that stripped off nearly all the foliage before they were discovered. I had a man go up into the tree with a big mallet and strike the limbs, and the caterpillars came down on to the ground like a shower of nuts after the first frost in the fall. Full-grown caterpillars, both brown-tail and gypsy, can be knocked off in this way, but if you strike the limbs of the tree when the caterpillars are small, they will merely spin down on their threads and hang there as if they were laughing at you, and after the pounding is over they will climb back up into the tree. When they are big, however, the little thread will break and they will fall to the ground. I took this photograph two or three hours after the tree had been shaken and the caterpillars are now trying to crawl up over the "Tanglefoot," and they can't do it.

Many of you saw during the latter part of last June the flights of the brown-tail moths, particularly around the arc lights at night. They do not seem to be attracted to the incandescents, but around the arc lights the air was white with flying moths and in some cases the electric light poles were coated white with them. If you are at all observant, you will have noticed on the ground around these electric lights a great many toads jumping about and gobbling up the moths. I don't know what kind of a digestion these toads have, but it is evident that it must be very good, for they eat a great many of these moths, brown hairs and all. This photograph was taken late at night, and this man with the moths all over him is immune from the brown-tail rash, otherwise he could not have been in the electric light business.

In Belmont advantage was taken of the fact that these moths were attracted by electric lights after dark, and the Belmont Society for the Suppression of Insect Pests made some traps which were set around the arc lights. They built the traps of telegraph wires, making a skeleton frame and covering it over with cloth, and over the cloth they smeared "Tanglefoot" or pinned on "Tanglefoot" fly-paper. I had the pleasure of counting two thousand dead brown-tail moths in this one trap on the morning after its first night's exposure. Twenty electric lights were eventually fitted up. Later on we found it was more economical not to coat the cloth with "Tanglefoot," but simply to take the "Tanglefoot" fly-paper and pin it on the sides and over the bottom of the trap, and then remove the fly-papers as they got full. Otherwise, in using the "Tanglefoot" which comes in bulk, the cloth would get so thickly covered that it was very hard to scrape off the moths and re-coat it.

The thing to do in regard to the brown-tail nests—although it is too late in the season to do it now—is to cut them off from the tips of the branches and burn them up. This work should be done just as soon as the foliage drops in the fall. Of course, it can be done any time before the last of March, but now the little caterpillars are out on the trees. It is important in this work to pick up every one of these nests after they have been cut from the trees and not let them stay on the ground. They must be burned up, and it is better to burn them in a furnace than in a bonfire, because in a bonfire you are pretty sure to leave some of them around the edges of the fire.

I shall now run rapidly through a series of slides showing the life history of the gypsy caterpillar and moth. I have taken the gypsy obviously for the reason that it is much more comfortable to experiment with them than with the brown-tail. If I had undertaken to make photographs of the brown-tail moth, I think I would have spent nearly all my time in scratching and not in taking photographs.

After the caterpillars are full grown they hang by a few silken threads spun from the tail and they begin to shorten and thicken up, as you see here, and assume this position. Pretty soon they twitch a little, and each time they twitch, some of the skin is pulled down towards the tail, and the body gets thicker and shorter. With each twitch more of the skin is pushed down towards the tail, until by and by it splits just back of the head and the pupa begins to come forth. At first it is of a delicate pinkish color, as you see it here. Each time it twitches, the pupa comes further and further out, until by and by it is entirely free. These peculiar flaps which you see here are to be later on its wings, and these are to be the feelers or antennae, and these are what are to be later on the moths' legs. Here is the empty caterpillar skin left hanging behind on the tree. Now, in a few minutes, it quickly loses its pinkish color and begins to turn brown. Very often it turns a much darker brown than this, a chocolate brown and even black. Here it hangs for eight, ten or fourteen days, varying with the temperature of the weather, until the time arrives when the moth is to come forth. Then it breaks away at the head and we see the golden yellowish color of the hairs upon the head of the moth. This process all takes place in a very few minutes, varying from fifteen or twenty minutes to half an hour, from the time the chrysalis breaks until the moth has come out and its wings have grown and it is ready to lay its eggs. Further and further the moth crawls out, and now we begin to see its wings. In a few minutes the wings are further seen, and they already have begun to grow. Now the moth is all out, and the empty pupa skin is left behind. The insect turns around and begins to crawl up the tree or fence, wherever it may be. It is an ugly and misshapen creature at this stage, with a tremendously large body and small, shrivelled wings, but they grow very rapidly. The body seems to shrink and the liquids from it flow out to the wings, and you can actually see them grow before your eyes.

Finally, after the wings are full grown, very gently the moth begins to raise them over its back. In this picture you can quite easily imagine a lady in a beautiful ermine cloak. Here is the face, here is a curious hat adorned with numerous stick pins, with the folds of the cloak hanging down on either side. Finally the wings are held directly out behind and the insect very slowly moves its body back and forth, as it drys them. It does not flap its wings, as some other moths and butterflies do, but it very slowly moves its body, and then, suddenly, after a few minutes, it brings its wings down to its side, as you see here. This particular moth shows a curious thing. We see here a very ugly and grotesque face on its back, and this photograph has not been retouched at all. Here is the chin, the mouth, the eyes and ears, a devilish sort of a face, that ought to be on every gypsy moth, though I am sorry to say it is not. By a strange chance, these pictures are very beautiful, and it seems rather queer that an insect which can do so much damage should have any beauty about it.

Within a few hours, and sometimes minutes, the female has mated and egg-laying is begun. This sometimes takes twenty-four hours or even longer. Slowly the eggs are deposited and covered with hairs taken from the body of the moth. Then the insect dies close by the eggs which it has laid, and future generations are left to vex and annoy us.

Finally, I want to call your attention to the differences between these two insect pests in their different stages. Here, on this side of the picture, we have an egg cluster of the gypsy moth, and on the other side a leaf nest of the brown-tail moth. Both of these we see during the winter months. These egg clusters of the gypsy moth are covered with yellowish hair, and no matter how cold it is the caterpillars will hatch out in the spring. These nests of the brown-tails we see in the tops of the trees ; they are full of little caterpillars, and in the spring they will crawl out on the first warm days. In the next pictures we see one full grown caterpillar. On this side the gypsy, with its characteristic double row of red and blue spots, six red and five blue,—and you must remember that it is the caterpillar of both the insects which does the damage by eating the foliage of the trees,—and here we have the brown-tail caterpillar with its two characteristic orange red spots near its tail and a row of white spots on either side. It is the brown-tail and not the gypsy that causes the rash.

Finally, we have the moths,—on this side the gypsy moths, these two lower ones being females, and here are the males.

Remember that the gypsy female moth does not fly, though the brown-tail does. Here we have the brown-tail moth, below the female with its characteristic golden-brown tail, and these two are males.

Now, I haven't said a word about parasites, because I don't know very much about this part of the subject, and the gentleman who is to follow me will tell you what has been done in this direction. I think it is up to each and every one of us to do all we can to help Mr. Kirtland, who has charge of the work of suppressing these pests. He has got a hard row to hoe, and he needs the encouragement and help of every intelligent man, woman and child in this state. I thank you very much for your kind attention.

(Applause.)

THE CHAIRMAN: The Association, by a great piece of good fortune, has present this afternoon the State director of this business, and Mr. Kirkland has very kindly volunteered to speak to the Association. I take pleasure in introducing him to you.

ADDRESS OF SUPT. A. H. KIRKLAND.

State Superintendent for Suppressing the Gypsy and Brown-Tail Moths.

Mr. President, and members of the Association, I find myself in about the predicament of the boy whose father was a lecturer, a monologist. The old man was practising up his monologue one day, and the boy heard him and said, "Pa, I want you to take me to the show." The father said, "All right, my son, next week I am going to give my monologue at such and such a theatre, and I will take you." "Pshaw!" said the boy, "I want to go to a real show." You people have had the "real show" and I am fearful that what I may have to add will not be in the nature of any important contribution. Professor Underwood, with the aid of his slides, has very ably treated the biology of the moths and the principal remedies. I am going to speak now of two or three other features, some of the larger features, of the work.

I want to show you first, as a matter of interest, the place where Professor Trouvelot lived in Medford at the time the gypsy moth escaped from his care. He was a poor man, and lived in this house surrounded by brush land. The gypsy moth was brought over here, as you probably know, with the idea of crossing it with the silkworm and thus producing a hybrid moth which would spin silk and yet which would not be subject to the diseases of the silkworm. The moths got away from him and escaped into this brush land and there multiplied slowly until they reached a point where the citizens of Medford could not take care of them, and the city had to appeal to the state. The state work of suppression was carried on from 1889 and 1890 up to the winter of 1900, at which time the moths were under control. Then the work was dropped for a time but was taken up again this last summer. I ought to say that at the time the gypsy moth escaped, Professor Trouvelot understood the importance of the affair and gave due notice of it. He notified the Harvard College authorities, he notified the people at Washington, he notified Professor Riley of Missouri, the leading entomologist of the country at that time, and did all he could to have the importance of the matter put on record. A couple of hundred dollars would have bought up the scrub land around his house at that time and I presume two thousand dollars would have bought the house also, and the whole business could have been burned up and the gypsy moth completely wiped out. But no one appreciated the danger. It is another case of hind-sight rather fore-sight.

This picture illustrates the creosoting process which Professor Underwood spoke about. The creosote is carried in tubs or pails, and the nests are soaked by means of a brush. We find in street work and in woodland work, where the moths are thick and the nests are up near the top of the trees, that it is a very advantageous scheme to take a pole and lash a brush at the end of the pole, and by means of this device a man can reach the under surface of the limbs and eradicate the nests in that way. That method is perhaps a cruder one than using a short brush, but it is effective with probably ninety-five per cent. of the nests.

The process of burlapping on a large scale is shown here. The rows of burlap are carried in a barrow, with a string through the centre of each row,—or very often the burlap comes as it is cut out of the bale, and thrown over the man's shoulder—and he puts a band around the tree, cuts it off, sticks in his knife, ties it and turns it down. This is all done very quickly. To one of our towns where they have shown a great deal of interest in putting on burlap this summer, I sent an inspector and he found that they were sending a man around with a string to measure each tree and then come back and measure his burlap, cut it off and take it back to the tree to tie it on. Our inspector went there and burlapped twenty-five trees in the manner I have described while this man was burlapping five by that method. That was an eye-opener to those people.

This picture shows the work of spraying trees, more particularly orchards and shade trees where they are not too tall. Many of our streets have been planted during the last ten years with Norway maples, and those trees are not so tall but that they can be sprayed from an elevated tower like this. In that way we can push the work very rapidly and very cheaply. This year there has been gotten up a rig—I am sorry I have not a slide of it—which is practically the same as is used by the electric linemen. On either side of the tower is lashed a 40-foot extension ladder or a 30-foot extension ladder, as the case may be, and those ladders can be run up about 15 feet above the tower. Then we lay a "boatswain's chair" or a piece of plank with four rings to hold it to the tops of the ladders, and a man can climb up to this platform and get up about forty feet in the air, and he can spray quite tall trees.

This picture shows the largest spraying device, I believe, in New England,—the largest one I have ever seen and I think it is the largest tower outfit in the country. It is the one used by the Boston Park Department and is very effective. It is mounted on a substantial wagon, having a gasolene engine with a direct connection with the pump, and by means of it one can get as high as 200 pounds pressure to the square inch. With this apparatus you can use a straight-away nozzle, and the pressure is so intense that the stream bursts into a fine spray. In this way you can spray tall trees fairly well, but those straight-away nozzles use up a tremendous amount of poison, although they make for economy in the way of labor.

This picture shows the outfit used by the Metropolitan Park Commission. One man is attending to the lower part of the tree, and the other man is working with a high pressure nozzle and reaches the top of the tree. As I say, this method wastes a good deal of the spraying material, but where the caterpillars are very thick and where time is short, as it often is in the spraying season,—for we are limited to fair days and cannot spray on rainy days,—we can do good work with a rig like that. It is a simple thing to run a ladder up on each side of this car and put a little platform on top of the ladders on which a man can stand at a relatively high elevation from the ground.

In brush land and scrub land, and very often in wood land, many nests remain on the ground, and it has been practically impossible for us, with the funds at our disposal, to go in and doctor every nest, turn over stone walls, etc. In other words, we have to apply wholesale methods. In such places we go in and clear the trees of the nests, after cutting out all the dead trees, the crowded trees and brush,—adopting good sensible forestry practice,—and let the ground go. Then in the summer time as soon as the eggs hatch, an oil flame is applied to the ground and in that way we burn up ninety-five per cent. of the caterpillars. I had complaint only yesterday from Swampscott. A man came into the office, a very intelligent man, and said, "Your people have cut over about one hundred acres of scrub pasture land down there and have left the brush in piles. Why haven't they burnt it up?" I told him we knew all about it. That particular section was the worst infected spot in Swampscott. Last winter, in spare time, it was cut over and the brush left there. In about ten days from now every nest will hatch out, and every spear of grass, every bit of dead brush, everything on the ground will be covered with these tiny caterpillars. Then, on a suitable day, when the wind is not too high, we can run a brush fire through all that whole business and for a few dollars we can wipe out the moths over one hundred acres in this badly infested territory.

This picture shows the extensive work that is necessary to put woodland and scrub land into condition for burlapping or for further treatment. We go, for example, into a white birch swamp, where the men cannot work to advantage and where they can hardly get in themselves in some cases, and there we thin out the trees, leaving single ones standing twenty or forty feet apart (this depending on the size), and taking out all dead and worthless stuff. Then the remaining trees will attract the caterpillars, because they furnish all the food that is left. When these trees are sprayed and burlapped, we get the caterpillars on that entire area and in this way we wipe them out.

Professor Underwood referred to the killing of trees by the gypsy moth, and this really is the most serious phase of the whole question, so far as this insect is concerned. You know our deciduous trees have considerable recuperative power. An apple tree or an oak tree will stand stripping two or thre years in succession before it succumbs. I have seen an oak grove in Malden—a clump of oaks of perhaps eighty years' growth—killed out absolutely by three successive strippings by the gypsy moths. Now, the conifers—the pines, hemlocks and spruces—are not so gifted with recuperative power. One single thorough stripping will kill them. This clump of white pines at Malden on the Melrose line, was stripped in 1904 by the gypsy caterpillars for the first time,—this is a matter of my personal knowedge,—and last June when this photograph was taken, these pines were dead, as you see here, and the bark even had begun to pel off. When Deacon Converse, the Malden philanthropist, gave the two cities of Malden and Melrose the Pine Banks Park, it was a beautiful place, containing some of the largest pines anywhere around Boston. Now the men in charge of the park later did not fight the gypsy moth effectively, and the result was that last year they found that they had got to go to work in a big way. They did the best they could and spent several thousand dollars there—a very large sum for such a small area—but could not save those beautiful pines. Four hundred choice white pines, in round numbers, are dead and have been taken out. "Pine Banks Park" is a misnomer. It might be called "Barren Banks Park," or "Rock Park." There are some pines left which they are working heroically to save, if possible, but the beautiful pine grove has been practically ruined and its beauty destroyed. I went with Governor Bell of Vermont out there when he was down here recently. He wanted to see some of the gypsy moth work, and when he saw this he said: "If this gypsy moth gets up into Vermont, I can see the finish of the summer boarder industry." That is, of course, a serious thing.

This little slide does not show much at first glance, but it is one I am particularly proud of and one I am very much interested in, because it shows what a poor hard-working laboring man can do when he really sets out. In this section of

Malden, farther up the street, there live a number of very well-to-do people. The whole territory was swept in 1905 by the gypsy moth plague. The moths simply riddled everything. Now, this man treated his gypsy moth nests around his house with creosote, he burlapped his trees, he went to the expense of having his trees sprayed. I don't know what he put into this work, but he is a man working for about a couple of dollars a day, a man of no resources, with a family to support, but he had a love for trees in his heart and he made up his mind he was going to save those trees because he loved them, and he did so. Now, in August, when everything was a barren waste all around him, these oak trees came through in very fair condition and he gave what to my mind was a mighty good object lesson in good citizenship to the people all around him, even to his wealthy neighbors. That shows what a poor man can do. Of course, a man with the resources of General Lawrence of Medford can accomplish a great deal more.

This map, gentlemen, shows the size of the problem which confronts the state superintendent. A year ago the legislature passed a bill—I wasn't here at the time—which had in contemplation the fact that the gypsy moth occurred in an area which included thirty-four cities and towns, and they made an appropriation based on that fact. When I took up the work, the middle of May, of course the first and most logical thing to do was to "take account of stock." The moths had multiplied during five years and they had spread widely. We didn't know what the size of the problem was. I organized a corps of trained men and sent them out to investigate. As fast as a man found one town infested, he went on to the next, until by winter we had located the gypsy moths up to the New Hampshire line, from Salisbury over to Methuen. We also found them in Dracut and Lowell, and as far west as Stowe, Marlboro and Hopkinton. To the south we found them in Stoughton and following the exact border of Plymouth County as far as Lakeville, and then over to Wareham. We have also found the gypsy moth at Bourne, Yarmouth, Barnstable and Orleans on the Cape, where they were undoubtedly carried by automobiles. Since Quincy has become so badly infested—and Quincy is really the gateway to the South shore—there have been days when the caterpillars simply hung in thousands from the trees, and nothing is more reasonable than to suppose that the automobiles passing under the trees and going rapidly toward the Cape have taken the moths there.

I want to show you here one of the parasite cages. We are working along the line of introducing parasites. We are trying to leave no stone unturned—trying to adopt every method that promises any sort of relief. Of course, the natural thing, the scientific method, is to get the natural enemies of the gypsy moth here and see if our climate will allow them to multiply; because we are fighting the devil with fire, and we want to get the fire as soon and as hot as we can. In Europe Dr. L. O. Howard has organized for us a corps of about fifteen of the best entomologists, all on salaries you might say, engaged in collecting all the natural enemies of the gypsy moth and sending them over here to me. We are preserving this material at Saugus, and shall, as soon as the parasites come out, liberate them in cages like this. In this enclosure there is a badly infested apple tree, and we shall put the parasites on that. This structure was made last summer. It consists of a large frame covered with two thicknesses of wire netting. We have had to keep a watchman there because the average small boy likes to throw stones, and he does not always appreciate the value of a scientific experiment. We shall put the parasites into these cages and give them a fair chance to fight it out with the gypsy moths. When we get a sufficient supply, we shall turn them loose in the woodlands in large numbers, and put out enough to make a fair test so that they may have a chance to mate and become colonized. In Europe the brown-tail moth has many parasites in the web stage. We have nothing of the kind here, at least, we have never discovered anything of the sort. The European webs of the brown-tail moth contain many tiny parasites that prey on the caterpillars in the web in the fall and again in the spring. When this fact was discovered, we at once ordered the collectors to turn to and get all the brown-tail webs they could find. They sent us over 108,000 of these webs from Europe. We put them in these tight boxes fitted with tubes through which light penetrates into the interior. The parasites emerge from the webs, and flying to the light go in large numbers into the tubes. We then take out a tube, cork it and put in a fresh one, and soon we have another full of parasites. But we have to separate the "sheep" from the "goats." There are very many parasites which are beneficial and there are parasites on parasites which are distinctly harmful. Dr. Titus, one of Dr. Howard's assistants in Washington, is at work sorting out this material and separating the sheep from the goats. We are going to destroy the secondary and harmful parasites and try to get what the bacteriologists would call "a pure culture" of the beneficial parasites and then we shall liberate them to prey upon the brown-tail caterpillars.

This picture shows another type of breeding cage, with plants for the insects to work upon. The next slide shows certain forms of parasitic insects. These are American, but are congeneric and practically similar in appearance to some which we are introducing. The Tachinid flies, which appear much like our common house fly, lay their eggs on the body of a caterpillar. In Europe we find caterpillars with large numbers of these eggs on the outside of their bodies. When the egg hatches, the grub burrows into the interior of the caterpillar, eats up the fluids, destroys the digestive apparatus and cuts the nerve cord. Then the grub comes out and buries itself in the ground and in a little while transforms to a fly such as you see here. The true ichneumon flies do not have to go quite so long a journey. They are armed with a stinger or ovipositor, and in this case the female is the one that does the good instead of the harm, contrary to the habit of the gypsy moth. She goes to a pupa or sometimes to a large caterpillar which is ready to pupate, and drives the stinger into the body and deposits an egg therein. The egg hatches and the grub destroys the caterpillar very much in the same manner as with the Tachnids.

I want to call your attention here to two or three insects which are often mistaken for the gypsy moth. Here is one which is sent to me perhaps a hundred times every year. It is the spiny elm caterpillar, the common caterpillar of the elm, willow and poplar. It feeds in clusters on the branches of the trees. We find it in June and then another brood in August and September. It has spines instead of hairs and red patches on the sides, but no blue spots. There is no need of confounding it with the gypsy moth caterpillar. It makes a very attractive butterfly, the first butterfly of the summertime, the Vanessa, or mourning-cloak butterfly. The species is distributed throughout the north temperate zone. It occurs all the way across the continent, and has been taken up in British Columbia nearly as far north as Alaska.

Another elm caterpillar, that of the tussock moth, shown here, is a common every-day pest which is often mistaken for the brown-tail caterpillar. Last year in the course of the season we had I don't know how many specimens sent us for brown-tails. If we remember that the tussock moth caterpillar has two pencils of hair pointing forward and one pointing backward and that it has four nice, white brushes on its back, while the brown-tail caterpillar has none of these markings, we need not confound it with the latter.

Here is a common fall caterpillar which last year was very abundant, the Datana caterpillar, which works on the apple, plum and sometimes on the cherry. We do not get these insects until into September or October, very often not until October. If we remember that the gypsy moth caterpillars are practically done feeding about the middle of July or the first of August although there are a few stragglers later, if we remember that they do not occur in large numbers as late as

September and also that they do not feed in clusters on twigs as this fellow does, also that they do not have the habit of sticking up their head or tail and swinging it viciously if disturbed, we can discriminate between the two insects. This caterpillar is common in orchards, especially in cities where the native birds have been driven away by the English sparrow. They can be handled by jarring them off the trees or by spraying. We do not recommend burning although many do burn them off.

Now that the gypsy moth has been so well advertised, people are on the lookout for strange insects. It seems as if every man who finds an insect which is new or strange or startling or gaudily colored or out of the usual run at once thinks he has the gypsy moth, and he boxes it up and sends it to me. This large caterpillar has been sent in repeatedly late in the fall for that of the gypsy moth, although of course it bears no resemblance to it. The moth from this caterpillar is the beautiful Polyphemus. Speaking of this matter, I think that a farmer in western Massachusetts a while ago about "went the limit." I think he was perfectly sincere, because he wrote in a cramped hand, and dried his letter over the lamp. He sent me a bat, thinking it was a gypsy moth.

This, I think, completes the slides. Now, just a word or two about the state work as it is now progressing. Briefly we have found that the gypsy moth occurs in 127 cities and towns. We have now an area, roughly, of 2300 square miles of infested territory as against 359 square miles known to occur when our work started last summer. The problem, in other words, is about six times as large as we thought it was. The moth area now includes about one-quarter of the state. The gypsy moth district embraces about seventy-five per cent. of the taxable valuation of this state. In other words, when we ask people to pay money to fight the gypsy moth, seventy-five per cent. of the money is raised right where the money is spent, and I have been assured time and time again by people in western Massachusetts that they are willing to be taxed for the other twenty-five per cent. for the sake of being protected. The bill under which we are working contemplates cooperation on the part of the individual citizen, the city or town, and the state. We haven't a very large force of men connected with the state office,—about thirty-five trained men,—and I will say that every man I have hired so far has been a man with a record of experience in this moth work and of an established reputation as a skilled moth man. These men scout the territory, locate the moth colonies, and then, as soon as the town work is organized, work with the town gangs, instruct them in methods of work, and then go in behind the town gang and scout again to see if the work is well done. Then we shift the inspectors from time to time so as to follow up each man's work. Last summer it was a pretty regular thing for many of the towns to appoint as their officers in this work men who had no experience, but we are getting to a higher state of efficiency every day. We are improving the work and getting things now so that when an inspector goes into a town, instead of reporting five hundred or a thousand nests overlooked by the town workmen, as in the past, if he reports fifty or sixty, we go down there and see what is the matter.

The city or town puts up the money to finance the work. We tell them how to spend their appropriation and call on them to appoint some local officer or board who shall be responsible for the work. If a city where the valuation is twelve and one-half million dollars or more spends five thousand dollars a year in this work, the state will reimburse it fifty per cent. of all money spent beyond that amount. In other words, if the city of Medford spends, say, $15,000, the state will give it back at the end of the year, if the work is satisfactory, half of the extra $10,000 over the first $5,000. In other words, the state will reimburse the city of Medford $5,000. The cities and towns having a valuation between twelve and one half millions dollars and above six million dollars spend one-twenty-fifth of one percent of their valuation, and above that the state will reimburse them eighty per cent. Then, the poorer country towns,—and many of them are among our worst infested districts,—having a valuation of less than six million dollars, spend one-twenty-fifth of one per cent. of their valuation, and then the state will reimburse them one hundred per cent. of all expenditure above that amount,—that is, the state gives them back all the excess expenditure. In other words, the purpose of the law is to give the least help to those cities and towns best able to help themselves and to give the most help, relatively speaking, to the poorer country towns.

But the thing does not end with the city or town. Every citizen of an infested district is notified in the fall of the year that he must clean up his property. Many of you have received these notices. The city or town fixes a date when the property shall be cleared, and if a man does not do the work by that time, the city or town has the right to enter—and so far as our funds permit it, does enter—upon that man's land and destroys the gypsy or brown-tail moths, and the cost of the work up to one-half of one per cent. of the valuation of the property is put in the tax bill as a special tax, just as in the case of the street watering tax. In other words, we touch the pocket nerve of the individual citizen. The result will be, in my judgment, that as soon as a man finds that he is going to be taxed for this work, he will familiarize himself with the moths and with the remedies for them, and he will clear his trees, cut down the worthless ones, and have only those he can take care of. The law, you see, gives us a good opportunity to get after the non-resident property owner. Hitherto this has been the obstacle right along. To give you an illustration. A man living in a western city owned real estate in Winchester. In 1905 his neighbors cleared their trees, but this man wouldn't do anything, although letters were sent to him. This year his trees are worse infested than ever. The town notified him to clear them and he refused. The result was that a gang went in there, cut down about two-thirds of his trees and cleared the rest, while the town has charged him up to the limit for the work. In other words, we spent his liability. Now, I suspect that next year he is going to look at this thing in a very different way. It has been the great misfortune of the work in the past that no matter how well you or I might clear our trees, if our neighbor chose to neglect his trees there was no way to get at him. Now, we have a law that is sufficient, and we do not propose to allow a man to maintain a nuisance to the detriment of his neighbors.

Just a word as to the outlook for controlling the moths. We have been obliged so far to give our particular attention to cleaning the streets, thus stopping the scattering of the caterpillars by teams and automobiles—to prevent their being caried farther into the state. That work is practicaly done. We have ninety-five per cent. of the streets in the gypsy moth district clear. We have practically all the settled residential streets clear. In other words, we have got the brown-tail and the gypsy moths where they will not readily poison people next year in these sections. We shall now give our attention to the wood land and carry on the work year by year until we can wipe out the large woodland colonies of moths, which is simply a question of funds and of men and of cooperation. Without cooperation we shall probably fail. But if we can get cooperation all along the line, if the state superintendent does his duty, if every city and town official will come up to the mark and do his duty, if every individual citizen will take a live interest in the work and do his part, I am sure that in a very short time, within a few years relatively speaking, we shall have the condition of the moth territory back where it was in 1899, and then the work can be left with the cities and towns for each of them to handle its own moth problem.

I have brought here a few bulletins which we have issued upon the subject, and I shall be glad to have you take them. If the supply is not sufficient, write me a line at No. 6 Beacon Street, and I will mail to you any number you may wish to use. I thank you for your attention.

(Applause.)

THE CHAIRMAN: Mr. Kirkland has given us a lot of useful lessons as to what public health officers can do. I wish the supreme health officer of the Commonwealth had anything like the power which Mr. Kirkland has, and I wish also that he might use it as wisely.

DR. DURGIN: I move a vote of thanks to Mr. Underwood and Mr. Kirkland for their excellent and instructive addresses.

THE CHAIRMAN: It is moved and seconded that a vote of thanks be extended to Mr. Underwood and Mr. Kirkland for their addresses. All those in favor of this will signify it by saying "Aye."

(Response, "Aye.")

THE CHAIRMAN: Contrary minded, no. It is a very unanimous vote. Is there any other business for the Association at this time? If not, it is moved that we now adjourn. If that be your pleasure, you will signify it by saying "Aye."

(Response, "Aye.")

THE CHAIRMAN: Contrary minded, no. The meeting is adjourned.

MUNICIPAL SANITATION.

By Charles V. Chapin, M. D.,

Superintendent of Health, Providence, R. I.

COLLECTION OF GARBAGE. All health officers recognize the extravagance and inefficiency of garbage collection by private scavengers who receive their compensation from the householder. Nevertheless, even in some large towns this method is still followed, and it is interesting to note just how expensive and inefficient it is. Thus in Grand Rapids* householders pay twenty-five cents per month for the removal of garbage, but not more than one quarter of the population avail themselves of the privilege. In Montclair, N. J.,† a town of 16,000 inhabitants, the removal of small cans of garbage costs from six dollars to nine dollars per year, and of large cans twelve dollars. The aggregate cost is about $12,000 a year, although only about one-third of the houses are served. These figures may be profitably compared with the cost of efficient municipal collection, which in Boston is twenty cents per capita; in Lynn, eighteen cents; in Brockton, seventeen cents; in Worcester, fourteen cents; and in Lawrence, ten cents.‡

DISCHARGE OF DIPHTHERIA PATIENTS FROM HOSPITALS. One of the topics touched upon in the very valuable report of Dr. A. G. R. Cameron on "Return Cases of Scarlet Fever and Diphtheria"¶ is the criteria for discharge of patients. It is surprising to learn that at one London hospital no culture whatever is taken from the patient before discharge; in two others none have been taken until very recently; at three others cultures are only taken when the mucous membrane of throat or nose appears abnormal, and in the four other hospitals only one throat negative is required for release. The average period of detention in the hospital of the 6,866 recovered cases considered by the report was 57.5 days. Of these, 87, or 1.2 per cent. carried infection to their homes after discharge. In Providence§ patients have always been discharged on two throat and nose negatives, except for a few patients discharged on one throat negative at the time cultures first came into use. The average period of detention in the hospital of 832 recovered cases since 1896 has been 21.2 days. Of the discharged patients, 1.3 per cent. carried infection to their homes, a result substantially as good as that obtained in London where the period of detention is nearly three times as long.

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*Report of the Board of Health for Year Ending April 18, 1904, p. 24.

†Report of the Board of Health, 1904, p. 27.

‡Municipal Sanitation, Chapin, p. 701.

¶Report to Metropolitan Asylums Board, London, 1901-2, pp. 59-72.

§Report of the Superintendent of Health, 1905.

A DISINFECTION EXPERIMENT. For reasons set forth in a paper read at the Providence Medical Association† it was determined to abandon official disinfection after diphtheria unless two throat and nose negatives should be obtained from each member of the infected family. The cultures were to be entirely voluntary as far as the family was concerned, and in their absence the warning sign was to be removed ten days after the disappearance of the membrane. As may be inagined, very few disinfections were done after the rule went into effect about March 1, 1905. During the year there were eighty-seven families in which disinfection was done, in two of which, or 2.30 per cent., recurrence of the disease took place within two months. In 258 families where there was no disinfection, there was recurrence in 1.55 per cent. It is also to be noted that the total number of cases in the city in 1905 was 562, or 218 less than in the preceding year, and less in proportion to the population than in any year since 1900.

MOSQUITO LEGISLATION. The State of New Jersey had previously made a considerable grant for the study of the mosquito problem and has now provided by law for the abatement of the nuisance.‡ The sum of $10,000 was appropriated by the State to aid towns in the work of abatement, but only $500 can be expended in one town, and the town must in each case appropriate seventy-five per cent. of the total sum required. Provision is made for the abatement of the nuisance when the breeding-place is outside of the township affected and for the co-operation of towns. For the purpose of investigation $5,000 was appropriated. Both appropriations are to cover two years. The agricultural experiment station has charge of the administration of the law.

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†Journal of the Providence Medical Association, 1905, page 109.
‡New Jersey Acts of 1905, Chapter 80, 30 March.

SANITARY ENGINEERING NOTES.

By Robert Spurr Weston, Assoc. M. Am. Soc. C. E.

PROTECTION OF INDIANA WATER SUPPLIES.* Brossman suggests the following water protection measures for the State of Indiana:

1. The passage of proper pollution laws covering municipal and industrial waste.
2. Appoint health boards or health officers in all towns not having the same.
3. Pursue a systematic investigation of the waters of the state and their sources of pollution, by the appointment of assistants under the direction of the State Board of Health, having tests made at regular intervals, as outlined above.
4. Empower the State Board of Health to take up the investigation of trades waste disposal, when such wastes endanger the public health.
5. Have the State Board of Health approve all plans for water supply and sewage disposal, and any industrial plants in which the waste is to be discharged into streams used as water supplies.
6. Give the State Board of Health the means of pursuing such investigations as have been outlined, and an engineer as a consulting member.

REPORT OF NEW YORK STATE WATER SUPPLY COMMISSION.† The report, including the report of the Chief Engineer, Mr. Myron S. Falk, was presented to the New York Legislature Feb. 1st. It discusses at length the question of water rights, land damages, municipal co-operation and state supervision of supplies. The engineer comments adversely upon the proposition to furnish a water supply to the state as a whole, and recommends for the supervision of the supplies of the state an adaptation of a certified milk system, the commission certifying water supplies much

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*Charles Brossman, Jr., Indiana Engineering Society, Jan. 20, 1906.
†"Engineering News," Feb. 8, 1906, page 147.

as the pediatric societies certify pure milk. The commission would hope to give the facts and let public sentiment do the rest. It does not think it advisable for such a commission to have final power over the water supplies of the state.

SEWAGE DISPOSAL IN ENGLAND.‡ The trend in England is toward the installation of trickling or sprinkling filters. They were proposed in nine-tenths of the schemes which came before the Local Government Board in 1905.

It is also interesting to note than on some English sewage farms peppermint has proved a successful crop, especially at Sutton (Surrey), where a profit of $700 was made last year.

SANITARY CONDITIONS IN THE NEW YORK SUB-WAY.¶ A recent report by Dr. G. A. Soper states that the air of the Sub-way is changed quite rapidly; that the percentage of carbon dioxide does not vary greatly from that of the street air; that the disagreeable features are due to the heat produced by the electric power and the smell of the lubricating oil, and that the movement of trains causes more movement of air than certain centrifugal fans which have been used experimentally. It is recommended that ventilators be placed between stations, which ventilators will open to let out sub-way air but will close against street air. The latter is best admitted at the stations. Dr. Soper condemns the broken stone ballast at the stations on account of the filth it collects. Much of the odor and dirt is due to the carelessness of the attendants in charge of the toilet rooms.

RELATION OF SEDIMENTATION AND ACID WASTES TO THE POTABILITY OF THE LOWER MONONGAHELA RIVER.* In 1905 the author investigated water supply conditions on the Monongahela River, which receives the sewage of nearly 200,000 people in the 80 miles between Greensboro and Pittsburg. This unsuitable water is used by the various towns along the stream and is considered to be safe and wholesome. This belief springs from two features peculiar to the locality:

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‡"Engineering News," Feb. 15. 1906, page 178.

¶"Engineering News," March 8, 1906.

*S. J. Lewis, "Engineering News," March 15, 1906, page 293.

1. The stream is for a large part of the year so completely without current that many think the sedimentation thus afforded will rid the water of all impurities.

2. It is thought that the large amount of acid industrial wastes exercises a powerful germicidal effect on the disease bacteria that may be in the water.

The author makes a very careful study of the amount of sedimentation and finds that the actual detention of the water in the river is very low, especially when the stream is at its maximum flow. This affects the typhoid fever death rate. For example, the sewage of Charleroi, with a population of 7,000, enters the river only a few miles above Monessen. The typhoid fever death rate at Monessen is from six to thirty-three per cent. of the total mortality, as against less than one per cent. in many American cities having unpolluted water supplies. Most of the typhoid has been connected with the use of the water supply. Worse conditions prevail at McKeesport where the typhoid fever mortality has gradually increased during the the last ten years. Again, Pittsburg has a typhoid fever death rate of over 100 per 100,000 and as high as 144 per 100,000. It would seem, therefore, that the slight amount of detention of the sewage in the river during the flood season would be useless on account of the scouring, and that during the rest of the year there is so little water in proportion to the amount of sewage discharged that the water cannot be called safe.

The addition of acid iron waste and free sulphuric acid is supposed to cause precipitation of iron and lime and remove the bacteria by coagulation and sedimentation as well as by its direct bactericidal effect. The amount of free acid is small and at times does not exist. Therefore the amount of precipitate is very variable and at times wanting. Furthermore, the maximum amount of acid alone would require many hours exposure to kill the bacteria. The author says in his summation: "The mineral acid to benefit the water must act either as a coagulant in the form of sulphate or as a germicide in the form of acid. For the former there is not enough iron; for the latter there is not enough acid."

REPORT OF GARBAGE AND REFUSE COLLECTION AND DISPOSAL AT COLUMBUS, O. Every reader of engineering literature has been struck with the progressiveness of the City of Columbus during the last three or four years, when after a Fabian policy of many years the City has not only perfected plans for a new sewage disposal plant and water supply system, but has just appropriated $290,000 for a new garbage and refuse plant based upon the report and detailed estimates submitted by Mr. John H. Gregory, Principal Engineer of the Board of Public Service.

The "Engineering News" (March 15, 1906, page 305) states that: "So far as we know, these estimates are the first detailed engineering estimates of the cost of providing the City with a complete plant for the collection and disposal of garbage and rubbish and of the yearly cost of maintaining and operating such a plant, including capital charges."

Antedating Mr. Gregory's report was a report by Mr. Rudolph Hering, who advises the City to collect both garbage and general rubbish and after hauling them to a proper site and mixing them, to dispose of them by cremation. On account of the use of natural gas in Columbus the output of ashes is small. There is no public collection of rubbish at present. About $30,000 a year is paid to public scavengers for the removal of rubbish alone. Night soil is removed by private contractors at an annual cost of about $10,000. Dead animals are removed by the sanitary company. Mr. Gregory estimates the population and tonnages of various wastes as follows:—

	1905.
Population,	160,000
Street sweepings, tons,	57,300
Ashes, if natural gas were not used, tons,	64,000
Garbage, tons,	17,600
Rubbish, tons,	8,000
Manure, tons,	45,000
Night soil, tons,	3,900
Dead animals, tons,	350

Mr. Gregory would include "all refuse the accumulation of which would be uncleanly or unsightly, the production of which is practically universal, and the removal of which cannot be better and more economically performed by the individual."

He estimates the cost of hauling at thirty cents per ton-mile. The report discusses cremation at length and states that additional fuel must be used in order to attain the temperature necessary for the complete and satisfactory combustion of the refuse and garbage. The production of heat and power, therefore, is not considered possible. Rubbish sorting is also thought to be impracticable.

The report is very comprehensive, and while the estimates are somewhat higher than are usual in American practice, still one must consider that the work proposed is unusually comprehensive and the results which ought to be obtained are obtained economically in comparison with other localities. These estimates are as follows:—

Construction		$289,850
Operating Expenses, 1907,		
Fixed charges	$21,328	
Maintenance and operation	86,940	
Total Operating Expenses		108,268

Operating expenses per capita for collection and disposal of garbage and rubbish in 1907:—

	Fixed charges.	Maintenance and operation.	Total.
Collection of garbage and rubbish	$0.049	$0.305	$0.354
Disposal of garbage and rubbish ...	0.070	0.182	0.252
Disposal of night soil	0.002	0.007	0.009
Grand Total	$0.121	$0.494	$0.615

It is hoped that this scientific study of the problems at Columbus will result in the erection of a garbage disposal plant which will not repeat many unsuccessful attempts in other cities. It should also be taken into consideration that in England, where garbage cremation is most successfully carried on, the furnaces are operated by skilled workmen whose like does not exist in the United States.

WATER SUPPLY IN PHILADELPHIA. During the last few months the commission appointed to investigate the water filter contracts in Philadelphia has reported and as a result the contracts have been annulled. The commission also recommended water meters for the whole supply, and this position would seem to be justified by the facts. However, the City Council passed resolutions condemning the use of meters, saying that the unrestricted use of water was necessary to the health of the community. When it is taken into consideration that Philadelphia already wastes two or three times as much water as it uses, the position of the City Council would seem to be badly taken and based upon false assumptions, among them, that stating that water meters were yet an unsuccessful experiment, the contrary of which, from the experience with their use in other cities, is known to be true.

"Engineering News," March 22, 1906, page 337, comments upon this action of the Council and censures it for unwarranted extravagance, adding that gas, which is sold by meter, is no more expensive, volume for volume, than is water, and that meters distribute the cost of waterworks service among those benefited in direct proportion to what they use and waste.

WISCONSIN PUBLIC WATER SUPPLIES.† This monograph is descriptive of the water supplies of the State of Wisconsin and should be valuable to those interested in such statistics. There are one hundred and twenty water supplies in the state. Fifty municipalities are supplied with artesian water; thirty with ground water; fourteen with lake water; twelve with river water, and for the remainder the supply is not definitely known. Three cities are supplied with river water purified by filtration, and four with lake water similarly filtered. The ground water supplies are more apt to fail than any of the others, and any serious trouble with the artesian water is due to excessive hardness and the presence of iron.

COLUMBUS SEWAGE DISPOSAL REPORT. Since the last issue of this Journal, the Report on the Sewage Disposal Experiments at Columbus, Ohio, which were conducted by Mr. George A. Johnson, has been published and distributed. This report is too voluminous to be reviewed in this Journal, but would well repay examination by any one interested in the details of this subject. The report recommends sedimentation of the sewage, followed by filtration through trickling filters at the rate of 2,000,000 gals. per acre per twenty-four hours, followed by sedimentation in suitable basins to remove the suspended matter. The aim of the proces is a non-putrescible, not a completely purified effluent.

WATER SUPPLY FOR THE CITY OF MEXICO.‡ The City of Mexico is now building a new water supply which will furnish clear, cold spring water of excellent quality and under ample pressure. The supply is to be brought to the city in a reinforced concrete conduit from a distance of twenty-seven kilometers. The water is elevated at the springs sufficiently to permit it to flow to the city by gravity. At Chapultepec it is pumped into a reservoir near the historic battlefield of Molino del Rey. The work is partially completed and it is expected that it will be finished during the coming year.

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†W. G. Kirchoffer, C. E., Bulletin No. 106, Engineering Series, University of Wisconsin.
‡"Engineering News," April 19, 1906, page 435.

SEWAGE DISPOSAL SUPERVISION IN ILLINOIS. The State of Illinois, which through its State Water Survey has for some years been collecting useful water supply data is, through the co-operation of this Survey and the State Board of Health, prepared to extend this investigation to the sewage disposal systems of the State.

AMERICAN RAPID WATER FILTERS ABROAD. Within the last two or three years a prominent American water filter company has installed water filters at Alexandria Egypt, which have been commended by Dr. Bitte, who tested their efficiency. Recently filters of this type have been installed at Massourah, Egypt, and during 1904-05 the Prussian Institution for Investigating Water Supplies has studied a small experimental American or mechanical filter plant at the Mueggel See works of the Berlin Water Supply at Friedrichshagen. The inspector was Dr. Karl Schreiber. The experiments were similar to those conducted at various cities in this country, and similar conclusions were reached. In general the results were very favorable, although not so favorable as the results obtained with the muddy waters at Alexandria and Trieste. Dr. Schreiber commends the system where it can be used to advantage and recommends that in the future more attention be given to it in Germany. It should be noted in this connection that few of the German rivers are as muddy as most American rivers, although the Oder, Weser, Elbe and other rivers show turbidities which are too high for successful removal by the ordinary slow filters without coagulant.

WATER FILTRATION AND SOFTENING PLANT AT COLUMBUS, OHIO.* In America water softening plants are a rarity, the only large municipal plant being the one at Winnepeg. The admirable studies at Columbus have evolved the design of a combined water purification and softening plant which is not only unique but promises efficient and economical results. The water of the Scioto river is very hard and contains a relatively large amount of magnesia. The treatment prior to mechanical filtration is as follows:—

"First. The raw river water is first treated with a saturated solution of lime water to combine with all or nearly all of the free and half-bound carbonic acid and with the magnesia. This reduces the carbonate hardness and when the reduction is completed causes the lime to appear as a fine and more or less granular precipitate, while the magnesia separates out as a gelatinous precipitate which is a hydrate.

"Second. The above reaction takes place very slowly when the water is at rest, especially at winter temperatures. To complete the reaction promptly it is necessary to stir the water for an hour or so to give it a similar treatment. This is done by passing the water for about an hour through highly baffled mixing tanks in which it can be kept at a velocity of 0.3 to 0.5 ft. per second, as found desirable. In this way a large share of the resulting precipitates are held in suspension and the double purpose is accomplished of completing the softening reactions and of using the precipitates for coagulating the turbid water.

"Third. Some ten or fifteen minutes after the river water and lime water enter these lime mixing tanks a solution of soda ash is applied to reduce the sulphate hardness. This causes the lime to be converted into a normal carbonate which under the existing conditions is nearly insoluble. This reaction is also a slow one and is followed by the stirring which the water receives in the mixing tanks in the presence of the resulting precipitates. After the water has passed through the mixing tanks it is led to the settling basins holding about twelve hours' flow at the full capacity of the plant. The basins are designed with several compartments to be used in series or in parallel, as found most effective in practice under the varying conditions. It is intended to remove the water from these basins and apply it to the filters as soon as the softening reactions are sufficiently completed and before the magnesia precipitate is entirely deposited. By this procedure it is expected that very little coagulant will be required,—probably none at all for months at a time. This use of magnesium hydrate as a coagulant is quite distinctly different from the lime treatment of the Ohio River in 1889 at Cincinnati, where the magnesia contents are too low to be of practical value. On the Lower Mississippi and elsewhere this process has apparently a field of usefulness.

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*"Engineering Record," Feb. 24, 1906, page 202.

"Fifth. When required, solutions of sulphate of iron or of sulphate of alumina may be added to the partially settled water to complete the coagulation of the water when unusually turbid.

"Sixth. When it is desired to remove the water from the settling basin and filter before the softening reactions are entirely completed. the last traces of caustic alkalinity (lime water) may be removed by mixing with the settled water a small percentage of raw river water and allowing the mixture to remain a few hours in the basins before filtration. This, of course, increases slightly the hardness of the softened and filtered water."

The features of this plant, of course, are its flexibility, the use of magnesium hydrate as a coagulant, and the addition of raw water for the purpose of removing the last traces of caustic alkalinity. Futhermore, the economy of combining the softening and coagulating processes marks a great step in advance in water purification. The plant has a nominal capacity of 30,000,000 gals. per diem, and the contract price was $524,209. The structure is an example of modern reinforced concrete construction.

COMBINED SEWAGE DISPOSAL AND REFUSE INCINERATION PLANTS AT MARION, OHIO.[†] Marion, O., has recently built a somewhat novel combination of sewage purification and refuse incineration plant. The sewage purification plant consists of three septic tanks, six contact beds of 5,000 sq. ft. each, and six sand disposal beds of 5,200 sq. ft. each. It is designed for 500,000 gals. per diem.

The incinerator is of the Walker type, 20x20x12 feet high. It consists of a combustion chamber, dust arrestor, and the usual devices for burning the products of combustion at a high temperature. The total plant cost $60,500. The whole plant is now being operated by one man, but it is expected that another man will be required when the amount of refuse is being collected for which the plant was designed.

COPPER IRON SULPHATE AS A COAGULANT FOR WATER PURIFICATION.[*] At Marietta, O., experiments have been made with the mechanical filters there using ferrous sulphate containing one per cent. of sulphate of copper, and lime as a coagulant. The bacterial results are very good, 99.33 per cent being removed on an average for the fifteen days. Out of the two hundred and twenty-eight samples of effluent taken during the test, thirty-two were sterile and forty-one contained only two bacteria per c.c. B. coli was found in two-thirds of the samples of raw water, but in none of the samples of filtered water. The effluent contained some caustic alkality. Mr. Brown, who conducted the experiments, attributes the results of the process to the bactericidal action of the copper sulphate. Inconsequent amounts of iron and copper only were found in the effluent.

STATE POTABLE WATER COMMISSION FOR NEW JERSEY. The Governor of New Jersey has formed a State Potable Water Commission, consisting practically of the State Riparian Commission and the State Geologist, the latter official already having more or less to do with the water supplies of the state.

[†] "Engineering Record," March 17, 1906, page 358.

[*] "Engineering Record," March 24, 1906, page 392.

WASHINGTON WATER PURIFICATION PLANT.† The new Washington filters have been put in operation this winter and have been operating as slow sand filters without coagulant with fairly satisfactory results only. The turbid water, previously settled in basins, is not completely clarified by the filters. This water is difficult to treat without a coagulant, and a coagulant has been recommended by various investigators and by the designer of the plant, Mr. Allen Hazen. This treatment will be necessary for part of the year only. There is considerable opposition in Washington to the use of sulphate of alumina, and although a bill has been introduced in the Senate to permit its use, authority has not yet been granted. The bacterial efficiency of the filters while good is not remarkable, and would probably be improved if coagulant were used during the turbid seasons.

LABORATORY NOTES.

By Frederic P. Gorham,

Associate Professor of Biology, Brown University, and Bacteriologist, Providence Health Department.

THE PRODUCTION OF ACID AND ALKALI BY BACTERIA. E. O. Jordan, University of Chicago, reported as follows at the Ann Arbor meeting of the Society of American Bacteriologists:—

Since Theobald Smith's work in 1895 it has been known that the acid reaction that develops in the broth cultures of many bacteria is produced by the action of the bacteria upon muscle-sugar. It has not been definitely recognized, however, that there are other substances besides sugar in the ordinary nutrient media which, under the influence of bacterial activity, lead to the production of a strongly acid reaction. One prominent text-book, indeed, affirms that "the formation of free acid is possible only upon nutrient media containing sugar." As a matter of fact, I have found the liquefaction of gelatin by bacteria or their sterile enzymes always gives rise to a marked acid reaction which may amount to as much as nine per cent. (*B. subtilis*) on the acid side of the phenolphthalein neutral point. A reaction of plus four per cent. is quite common in cultures of liquefying species. This is not surprising when it is remembered that substances like glycocoll and the amino-acids are conspicuous among the digestion products of gelatin. The simultaneous production of ammonia by bacteria tends to diminish the acidity of liquefied cultures, in some cases (e. g., *B. pyocyaneus* at 20° C) the acidity being nearly or quite overcome. The acidity is not confined to the liquefied area, but, as might be supposed, diffuses throughout the medium, altering the reaction of the gelatin at quite distant points. In nutrient agar, on the other hand, the diffusion of alkaline products alters the reaction of the medium in the opposite direction. A standard reaction for culture media, therefore, is valid only as an initial reaction. Gelatin and agar, inoculated with liquefying species, begin to diverge from the start and in a short time may become totally different. Bacteria make their own reaction in broth, gelatin and agar, and useful as a standard reaction may be, it has distinct limitations.

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†"Engineering Record," April 7, 1906, page 445.

Some writers have attempted to establish a fundamental distinction between acid and alkali production by bacteria. Thus Gotschlich in Kolle and Wassermann's "Handbuch," 1, p. 100, expresses himself as follows: "In general it may be said that acid production always depends upon a splitting of sugar (or similar substances, like glycerine, etc.); while alkali formation is a synthetic process and stands in intimate causal relation with the growth and increase of bacteria." Such a view would seem to be eminently artificial, since the ammonia to which an alkaline reaction is due is as truly a decomposition product of nitrogenous bodies as the amino-acids formed in the digestion of gelatin of the lactic acid in the fermentation of sugar. Both processes go on simultaneously, and the reaction of a culture medium in which bacteria are growing depends not only on the ability of the species to attack certain food substances, and on the chemical constitution of those food substances themselves, but also on the precise period of growth at which the reaction is tested.

EXPERIMENTS ON THE STAINING PROPERTIES OF BACTERIA WITH SPECIAL REFERENCE TO THE GRAM METHOD. Dr. D. H. Bergey of the University of Pennsylvania reported at the same meeting that careful search in text-books failed to reveal definite information as to the factors concerned in the Gram method of staining. There is even confusion in different text-books as to the properties exerted by the ingredients employed in the Gram method.

Investigation shows that the Gram reaction follows the employment of the pararosanilin dyes, especially the violet dyes of this group, such as crystal violet, menthyl violet, or mixtures of these known as gentian violet. The influence of the iodin is to form a new compound with the stained protoplasm of certain bacteria, which compound is insoluble or feebly soluble in alcohol. The alcohol serves as the decolorizing agent.

The exact difference in the chemical constitution between species of bacteria that stain positively and those that stain negatively by the Gram method is not definitely known, but the chemical constitution of the bacterial cell influences the behavior of the organism toward the Gram method.

Experiments along these lines are still in progress.

PREVENTIVE THERAPEUTICS.

By Herbert D. Pease,

Director Antitoxin Laboratory, State Department of Health,
Albany, N. Y.

PREVENTION OF TETANUS. The contribution on the use of tetanus antitoxin in France for the prevention of tetanus in horses and animals, published under the Section of Veterinary Sanitation in the last number of this journal, should still further impress American surgeons, practitioners, and public health officials with the need for making a regular practice of administering preventive doses of tetanus antitoxin in all cases of injuries when there is the slightest possibility that any unsterilized foreign body, or substance, has been carried into the wound, and either cannot be removed or has been allowed to remain in the tissues for a time.

The tetanus bacillus grows only in the absence of oxygen, but there are a variety of natural conditions under which the anaerobic condition is brought about. Thus, wounds of parts poorly supplied with blood, or in which the tissues are so destroyed as to impede or stop the circulation of fresh blood, or in which other micro-organisms capable of using up the available oxygen flourish, render possible the development of the tetanus bacillus if it has been carried into the tissues during such injuries.

The tetanus bacillus has a wide-spread habitat, but it is very common in garden dirt, manure, etc. It is undoubtedly present on the skin of many individuals, for many cases develop from injuries inflicted in such a manner that the clothing over the part is not torn.

Even apparently clean wounds which have healed by first intention have been followed by tetanus in some cases. This can be accounted for by the fact that the tetanus bacillus does not produce suppuration and if pyogenic bacteria are absent there may be no evidences of any infection. A very slight development of the bacillus is sufficient to produce many human fatal doses of tetanus toxin.

The toxin is transmitted to the central nerve cells, upon which it exerts its toxic action, only through the peripheral nerve terminals and the axis cylinders of the motor nerves. After the toxin has been absorbed by the nerve terminations and is in the nerves, it is unaffected by any antitoxin present in the circulating blood. If, however, the antitoxin has been administered in advance of the absorption of the toxin by the nerves, complete neutralization of the poison takes place in the blood and no tetanic poisoning follows.

All the practical results from the use of tetanus antitoxin as a preventive agent support this statement. Tetanus infection has never developed subsequent to the administration of a preventive dose of tetanus antitoxin in this country. The practice of using such doses in all suspicious injuries at the time of dressing has become very general in the hospitals and dispensaries in some sections of the country, and their experience in this direction, in what must already be thousands of cases, entirely supports the statement that tetanus antitoxin administered soon after the infliction of an injury affords perfect protection from tetanus.

For small injuries a dose of ten to twenty cubic centimeters should be administered subcutaneously. In extensive injuries with laceration of muscles, antitoxin, in either the liquid or dried form, should be used locally in addition to the subcutaneous injections. This local use is intended to protect the ends of any torn nerve trunks from the absorption of toxin directly from the site of injury.

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Henry H. Wilcox. 7

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C. J. McCormick, M. D.
Marshall J. Mosher, M. D. 1
Charles A. Willis, M. D.

Watertown

Sumner Coolidge, M. D.
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Waverley

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Wellesley

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Westboro

D. P. Cilley, M. D.
Charles S. Knight, M. D. 2

Westminster

A. E. Mossman, M. D. 2

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Woburn

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F. H. Baker, M. D. 5
W. T. Clark, M. D. 1, 10
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AMERICAN JOURNAL OF PUBLIC HYGIENE
AND
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[The Association as a body is not responsible for statements or opinions of any of its members.]

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THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH was organized in Boston, March, 1890, *with the following objects: The advancement of sanitary science; the promotion of better organization and co-operation among local boards of health, and the uniform enforcement of sanitary laws and regulations.*

THE JOURNAL OF THIS ASSOCIATION has for fifteen years faithfully reflected the views of the public hygienists of Massachusetts. With the November issue of the year 1904, *the encouragement received from many hygienic quarters induced the Association to undertake the expansion of the Journal to a national standard, with the co-operation of many noted sanitarians as editors. A new title was selected, while the older and well-established title was retained also.*

The dates of publication are FEBRUARY, MAY, AUGUST and NOVEMBER of each year.

THE JOURNAL will contain the papers read at the meetings of the Association, papers contributed by hygienists, report of the discussions, editorials, abstracts, reviews and hygienic notes of professional interest. Subscription rates, $1.00 *per year. Reprints furnished at cost price.*

All Communications concerning the JOURNAL, copy, proof, subscriptions, advertisements, etc., should be addressed to the Managing Editor, DR. H. W. HILL, 739 *BOYLSTON ST., BOSTON, MASS.*

All communications concerning the ASSOCIATION should be addressed to the Secretary of the Association, JAMES C. COFFEY, CITY HALL, WORCESTER, MASS.

All bills not relating to the Journal, and MEMBERSHIP DUES ($2.00 *per year), should be sent to the Treasurer of the Association, DR. JAMES B. FIELD,* 329 *WESTFORD ST., LOWELL, MASS.*

EDITORIALS.

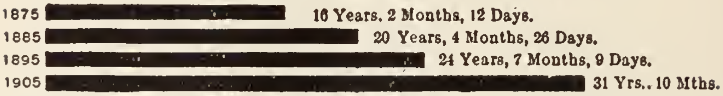
CHICAGO VITAL STATISTICS AGAIN.

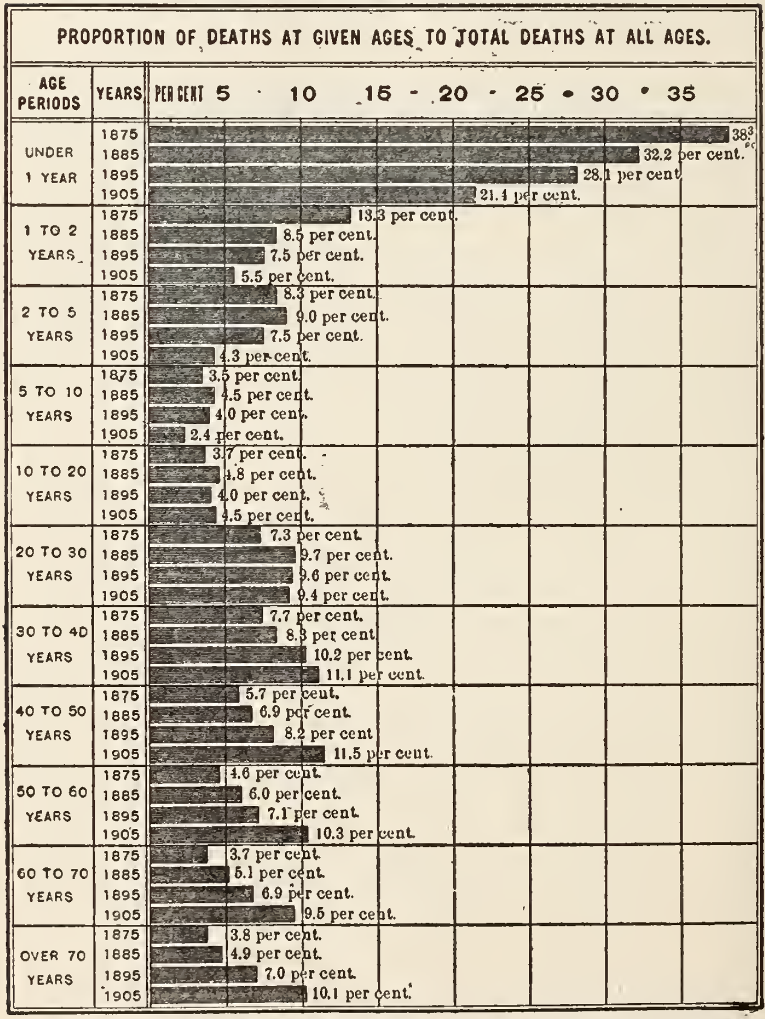
Our criticisms of the Chicago Vital Statistics found their way into the daily press on April 14th when the Chicago Record-Herald reprinted a large part of what was said in the American Journal of Hygiene on this subject. The Chicago Tribune took the matter up editorially and in the news columns on April 16th. A single exposure in the public press will do more to check the extravagance of the Chicago Health Department than any amount of criticism in professional journals. Repeated attacks during several years had failed to draw a spark from Chicago, but the publicity afforded by the Tribune and Record-Herald gave the Health Department a real sensation.

The work of the special committee of the Chicago Medical Society was a singularly appropriate forerunner of the Biennial Report for 1904 and 1905 which was in press when the committee was appointed. The frontispiece to that report is a fine example of that form of statistical absurdity which most delights Chicago, and oftenest provokes the self-appointed critics. It is the oft-told tale of increasing duration of life in Chicago, and is reproduced here because it carries its own reputation, as is not usually the case. The four columns at the top represent the average[1] age of decedents in 1875, 1885, 1895 and 1905, and we are told at the foot of the page that the exhibit signifies a doubling of the average duration of human life in Chicago in a single generation. But in this exhibit the misguided statistician has included an analysis of the mortality by ages, and this circumstance furnishes the long desired proof that the statistical vagaries of Chicago are chargeable not to moral obliquity. but to mental infirmity.

INCREASING DURATION OF LIFE IN CHICAGO

AVERAGE AGE OF DECEDENTS IN CHICAGO IN THE YEARS—





Measured by the average age at death of all who died in the city of Chicago thirty years ago and of those who died in 1905, the average duration of life in this city has nearly doubled during a single generation.

A reasonable interpretation of the figures is to be sought in the age distribution of the dead. I have rearranged these figures for 1875 and 1905 in the following table and the Baltimore figures are also shown for comparison.

Age distribution of the dead in Chicago in 1875 and 1905, compared with the age distribution of the dead in Baltimore in 1905:

	Chicago		Baltimore
Ages	1875	1905	1905
Under 1 year	383	214	—
1—2	133	55	—
2—5	83	43	—
Total under 5	599	312	292
5—10	35	24	24
10—20	37	45	45
20—30	73	94	91
30—40	77	111	91
40—50	57	115	101
50—60	46	103	103
60 and over	76	196	253
	1000	1000	1000

Note that in 1875 more than half of Chicago's dead are under the age of two years, and about one in fourteen was over 60. In 1905, on the other hand one-half of Chicago's decedents were over 30 years of age, and about one in every five was over 60. To the normal mind this indicates that children were relatively more numerous, and old persons relatively fewer in Chicago in 1875 than in 1905. Comparing the 1905 mortality of Chicago with that of Baltimore for the same year, one finds that while Baltimore counted 292 children under 5 years in every 1000 dead, Chicago counted 312 children under 5 years in every 1000 of her dead. If

Chicago arithmetic were good in Baltimore, we should say that the Chicago mortality for that age period is 6.85 per cent greater than that of Baltimore. But that would be atrocious nonsense. Above the age of 60, Chicago counted 196 in every 1000 of her decedents, while Baltimore counted 253 above that age in every 1000 of her dead. The arithmetic of Chicago would interpret this to mean that men over 60 have 29 per cent better chances of continued existence in Chicago than in Baltimore. That would be atrocious nonsense. The figures mean simply that Chicago has relatively more children under five and relatively fewer persons over 60, living and exposed to the uncertainties of life. The figures mean nothing to the advantage or disadvantage of either city. If the figures mean neither advantage nor disadvantage, then we should be able to learn, from the mortality figures for *both* cities with the population figures for *one* city, how many people were living in these ages in the *other* city. The U. S. Census Reports for 1900 show that Chicago had 112 persons below 5, and 42 persons above 60, in each 1000 of her living population, or 154 (42 plus 112) persons living in both periods. Chicago lost, in 1905, (312 plus 196) 508 persons in both age periods, while Baltimore lost 545 (292 plus 253) in both age periods. The problem is to find how many persons, other things being equal, Baltimore ought to have had alive in both age periods. The formula is $\frac{X}{545}=\frac{154}{508}$ and the result is $X=165$.

Baltimore, other things being equal, should have had 165 persons above 60 and below five for each 154 persons in Chicago in these two age periods.

Below are the census figures showing age distribution of the living in both Chicago and Baltimore in 1900, and it will be noted that Baltimore had in fact 164 persons in their age periods while our computed number was 165. Interpreted Chicago-wise this would mean that Baltimore has six-tenths of one per cent over Chicago in the matter of mortality at the extremes of life. But this would be atrocious nonsense in the twentieth decimal dilution.

AGE DISTRIBUTION OF LIVING IN CHICAGO AND IN BALTIMORE IN 1900:

	Chicago	Baltimore
Under 5 years	112	99
5—10	110	101
10—20	183	195
20—30	202	201
30—40	176	148
40—50	113	108
50—60	62	83
60 and over	42	65
	1000	1000

Baltimore is older than Chicago and the flamboyant page means only that Chicago in 1905 is about twelve times as old as she was in 1875. In other words the verdancy of her arithmetic signifies the succulent verdure of youth.

Let us see how old Chicago is as compared with Baltimore. If one divides a population into two equal parts so that half the people are above and half below a certain age, the age at which the population thus evenly divides is called the median age. Taking the figures here discussed one finds that the median age of the dead in Chicago in 1875 was under two years. If we divide the roll of the dead into equal parts, half of the dead are found to be under, and half of them over the age of 1.9 years. Thirty years later, the roll of the dead in Chicago, in 1905, splits at 32.25 years. The median age of the dead in Baltimore in 1875 cannot be thus ascertained, but in 1905 the median age of the dead was 35.3 years. The median age of the living in Chicago in 1900 according to the Census figures was 24.7 years, while the median age of the living in Baltimore in 1900 was 25.2 years.

Median Ages of the Dead in Chicago and Baltimore.

Chicago		Baltimore
1875	1905	1905
1.9 yrs.	32.25 yrs.	35.3 yrs.

Median Ages of the Living in Chicago and Baltimore in 1900.

Chicago	Baltimore
24.7	25.2

From these figures it will be seen that on any unit of age for a city corresponding to the unit of age for an individual, Chicago in 1875 was a cooing babe attired with safety pins, while Baltimore had a piping treble voice and short breeches.

JOHN S. FULTON.

THE REAL SIGNIFICANCE OF BACTERIAL STANDARDS (COUNTS) FOR MILK.

The sources of impurity in milk may be classified as intra-bovine and extra-bovine. Under intra-bovine sources lie those derived from the cow itself before the withdrawal of the milk, in the form of chemical bodies, the result of abnormal metabolism, or in the form of bacteria or bacterial products, derived from infections of the cow. Under extra-bovine sources lie all the incidental and accidental contacts which the milk after withdrawal from the cow suffers from dust, hands of the milkers, utensils, etc., etc.; and the deliberate non-accidental addition to the milk of foreign substances. (Legally the subtraction from the milk of any normal constituent is also considered as an adulteration.) Leaving out of consideration infectious material added to the milk by milk handlers suffering from, or in close contact with, the ordinary infectious diseases, the ordinary source of the serious extra-bovine impurities in ordinary unadulterated milk is manure. Only the most extraordinary precautions will prevent the seeding of milk with manure or the bacteria of manure, and a moment's consideration of the nature and life history of the ordinary cow and of the ordinary process of milking will make this entirely obvious.

The souring of milk is universal and (practically) inevitable because the admission to milk of manure or manure-derivatives is universal and (practically) inevitable. The souring of milk indeed has come to be considered a normal process, and the housekeeper complains if the milk does not sour "in the right way" or "at the right time." But this is no more than was believed of pus, which not so many years ago was considered a normal process in the healing of wounds—so much so that physicians distinguished between various forms and stages, spoke of "laudable pus" and were distressed if a wound did not begin "discharging nicely" at the right time. Yet pus was not an essential; it was an incident: but an incident of universal and (practically) inevitable occurrence because under the conditions of those days the admission to wounds of surgical dirt was universal and (practically) inevitable. Eliminate surgical dirt from wounds, and the majority are pusless—eliminate manure from milk and most milk will keep well. But the souring of milk is only a symptom, and a relatively harmless one, of the bacterial action in many directions, set up less obviously and constantly it is true at the same time by the same manure or rather by its bacteria. "The milk, the whole milk and nothing but the milk," is what we now demand. But to eliminate manure from milk requires a technique and training not unlike that which the modern surgeon receives. To make milking an aseptic operation is an ideal that while it may be striven for, is unlikely to succeed outside of specially designed and most carefully supervised dairies. Hence the best that can ordinarily be done is to insist on as little initial infection of milk as is practicable, and to pursue such treatment of the milk after the almost inevitable infection it almost invariably receives as will prevent the multiplication of the bacteria as far as possible. The catchwords are *cow, cleanliness, cold* and *quickness.* The cow should be healthy, well-fed, and well cared for in all particulars, to insure a high physiological standard and to eliminate the intra bovine impurities. Cleanliness in every detail should be carried out to eliminate initial infection from extra-bovine sources as far as may be; cold should be secured to restrain the development of such infection as cannot be excluded; and quickness in transit and delivery insisted on to insure that the milk is used up before it gets any worse than the stage already reached.

Of course, many persons, admitting all this, will nevertheless say that milk plus manure has been used for thousands of years—their ancestors, immediate and remote, used it—they themselves use it—why fuss about it? The sanitarian has little objection to manure—so long as it contains only organisms which do not disastrously affect the human. Were manure a pure culture of the souring bacteria, there would be little or no sanitary objection to it. But manure is not a pure culture of any one organism—nor a mixed culture of known and unvarying species. Manure is a mixed culture which varies in content, so that it is always under suspicion. It may contain at any time almost any organism, and some of these are themselves dangerous or so affect milk as to make it unfit for food.

The bacterial count of milk is often misunderstood. We eat and drink millions of bacteria every day—our own intestines contain millions of them all the time. Why then should we approve a milk containing 10,000 bacteria and disapprove one containing 20,000? Is not this swallowing a whole caravan of camels, while straining out a single gnat? Besides, it is admitted that the great majority of bacteria in milk are harmless; while the bacterial count is not calculated to discover the harmful ones, if present.

The fact is that the bacterial counts of milk, and this is particularly true of the low counts established for certified milk, do not bear any direct relationship to the poisonous properties of the particular milk from which they come. A milk of 20,000 count is not by any means necessarily twice as bad as one of 10,000 count or 20 times as bad as one of 1,000 count. Indeed if the 20,000 in one case were souring bacteria and the 1,000 in the other were typhoid bacilli, the 1,000 count milk would be infinitely worse than the 20,000 count. The true relation of the count to the milk is that of a cyclometer to a bicycle. By attention to "cow, cleanliness, cold and quickness" in all of the tens of thousands lots of milk now distributed daily all over the continent, the average sanitary quality of all milk would be vastly improved. But how determine, without an amount of inspection quite impracticable, whether these factors have in truth been observed? Milk containing initially even a few bacteria as the best of milk is almost sure to do, carries within itself an automatic register, which faithfully sums up all the insults the milk has received, just as the cyclometer sums up the miles the wheel has traveled. In any given case inattention to any one factor—the admission of an unusual lump of dirt to the milk, an unusual delay at the station, the exhaustion of the ice supply in a particular wagon on a hot day, etc., etc.,—is registered at once by an increase in the bacteria. The bacterial count alone will not tell what the nature of the insult was, any more than the cyclometer will tell where the wheel has been—but the sum total is registered infallibly in both cases. The object in setting a bacterial standard is not merely to secure a few less bacteria per glass, but because the producer must observe all the details necessary concerning "cow, cleanliness, cold and quickness," if he is to meet that standard.

The sources of the impurities in milk are understood perfectly, and nearly perfect techniques for their elimination have been devised, but it still remains to accomplish the most difficult task of all— to put these into practice, uniformly and constantly, everywhere. To trace the real significance and source of pus in wounds, and to elaborate a technique to eliminate it was a task simple and easy compared with the subsequent training of thousands of surgeons to appreciate and use the necessary arts. Yet surgeons are men of high education and intelligence, and the elimination of pus from wounds is a matter of professional pride and profit to them. To trace the sanitary impurities of milk to their source and to elaborate a technique for their elimination, is a task already accomplished. It remains to train hundreds of thousands of prejudiced, ignorant and unskillful "hired men," inappreciative of the results, to follow, at a financial loss, and under almost impossible conditions the sort of technique which highly trained surgeons find difficult enough in modern hospitals. Is it any wonder that the production of low count milk by the ordinary dairy is a heart-breaking affair? Yet it must be done, somehow, sooner or later, unless asepticism be abandoned, and antisepticism (in the sense of pasteurization) be accepted as the substitute. That a single producer or a group of producers here and there can manage to put on the market a milk sanitarily perfect at a remunerative price does not for a moment solve the problem. Only the well-to-do customer can—or at least will—take advantage of this. It is the business of the sanitarian to secure pure milk for *everyone,* and such a problem might well dishearten any executive. What the ultimate solution may be it is hard to say. The bacteriologist, the veterinarian, the milk-expert have all done their parts and have done them well. The milk problem as it stands now is no longer "what to do" but "how to get it done."

H. W. HILL.

JULY QUARTERLY MEETING

OF THE

Massachusetts Association of Boards of Health.

The quarterly meeting of the Massachusetts Association of Boards of Health was held at Gallup's Island, Boston Harbor, on Thursday, July 26. Dinner was served at 1 P. M.; and after dinner a business meeting was held under the presidency of Dr. H. P. Walcott.

Members of the Association were elected as follows, upon the recommendation of the Executive Committee:

F. E. Stetson, M. D., New Bedford.
Cooper Gaw, New Bedford.
John P. Fahey, Taunton.
John O'Hearn, Taunton.
Chas. B. Fuller, M. D., Waltham.
Richard Collins, M. D., Waltham.
Melvin M. Johnson, Waltham.
Wm. Cook, Leominster.
A. O. Hitchcock, M. D., Fitchburg.
Robert A. Rice, M. D., Fitchburg.
R. E. Stevens, M. D., Marlboro.
Godfrey Knight, Avon.
Michael W. Norris, Boston.
Philip S. Parker, Brookline.
John A. Curtin, Brookline.
Jonas E. Bacon, M. D., Brockton.
Geo. C. Hunt, Worcester.
F. W. Howe, Framingham.

It was voted to dispense with the reading of the records of the last meeting.

THE PRESIDENT: Is there any other business to come before the meeting before proceeding to the programme of the afternoon? If not, a paper upon "Some of the Advantages of Certified Milk," by Dr. A. P. Norris of Cambridge is now in order. I have the pleasure of introducing Dr. Norris.

THE WORK OF THE CAMBRIDGE MILK COMMISSION.

By Dr. Albert P. Norris, Inspector of Milk of the
City of Cambridge.

Mr. President and Gentlemen:—

When Dr. Durgin asked me to report briefly what Cambridge was doing in the direction of certified milk I earnestly begged off, feeling that we were just starting and thus far were without extensive practical results.

In deference to his wishes, however, we will gladly run over the history of our Cambridge undertaking, which, in its limited way, is part of the fruit of our aggressive State Secretary, Dr. Harrington's crusade for purer milk.

Sometime in December last a meeting of the Boston Medical Library Association was devoted to this Pure Milk Problem.

Dr. Goler of Rochester, N. Y., explained the Rochester idea, where, by the establishment of municipal infant-feeding dispensaries of sanitary milk during the hot summer months Rochester had reduced her infant mortality about 60 per cent. since starting nine years ago.

Dr. Pearson of Cornell University was the next speaker. He outlined the methods needed to carry on a dairy in a conscientious cleanly way.

Lastly Dr. Harrington gave a telling paper upon the Sanitary Importance of Clean Milk. How manure is simply teeming with myriads of tiny bacteria from the intestines of the cows, and how unless particular pains are taken to thoroughly groom and cleanse the cow many caked particles of dung fall into the milking pail, serving as seed which grow rapidly when the milk is improperly cooled. Further that clean utensils and a persistent temperature less than 50 degrees Fahrenheit must be maintained to hold back bacterial growth and thus ensure sweet, clean wholesome milk. Dr. Harrington went further, describing other types of bacteria which mere negligence often allow to gain entrance into milk and which affects infants with disease and distress.

Infant mortality rates were noted in our leading cities and Massachusetts is shown as having six cities with rates above one death to five births, while Cambridge and Boston are very close to that high rate.

Let me state here that Dr. Rose of the State Board is doing a most valuable work inspecting each farm producing merchantable milk and carefully outlining needed imyrovements; but to obtain milk of highly satisfactory quality two requisites must be fulfilled.

(1) Consumers must appreciate that such milk costs more to produce.

(2) Producers must be conscientious in keeping out dirt and keeping the milk cold. No one who attended that meeting could fail to be impressed with the urgent need of having some commission established which would co-operate with the State and Municipal Inspection, and alike protect the consumer willing to pay for pure milk, and patronize the conscientious producer by certifying such milk.

As spring came on and with it the surety that ice bills were to be high, it seemed probable that milk would be inadequately iced and our community liable to suffer more than usual in those sections using the cheapest milk.

Members of the Cambridge Medical Improvement Society became interested in having available sources of milk which could be unqualifiedly recommended and a meeting was devoted to a discussion of the Cambridge conditions.

At present the Cambridge milk supply of 10,000 gallons daily comes from three groups: 150 cows within her borders; from about 150 suburban farms yielding one-third our supply, and the largest part, almost two-thirds of the whole, comes in common with the Boston supply over the railroads centering there.

Cows kept within our borders are in small herds, many of them for private use. All dispense their milk within a few hours after its production.

The suburban farms usually sell their milk to a middle man who bottles and retails the milk, usually 36 hours old, and very similar in character to that of the next group, the Railroad or Contractors group. These gentlemen have a gigantic task in collecting from an ever increasing circle of farms, milk which may be transported and sold still sweet and palatable 36 and more hours after it is produced. It may be said that the contractors are steadily working to improve farm dairy conditions, but their field is very large and old Yankee prejudices against innovations are hard to overcome.

The neat establishments of most of the contractors are in a good condition of cleanliness and equipped with most ingenious appliances for the rapid conveyance and bottling of milk.

As we looked over the above groups of farms we found *very* few farms sending milk directly to the consumers. In practically all cases the milk of several or many dairies is mixed by the wholesaler or middle man before delivering it. Secondly, comparatively few farmers have ice with which to cool their milk. Springs and wells at a temperature of from 55 to 60 degrees Fahrenheit during the summer months are entirely inadequate to prevent the rapid growth of germs.

I think you will see the difficulty immediately in endeavoring to certify a milk which passes through many hands and is mixed with that of other dairies, the good ones neutralizing the bad. In dealing with such a perishable food so absolutely dependent upon cleanliness and cold, the hands through which it passes should be as few as possible, and certified milk must be bottled, sealed and iced at the dairy, thus throwing the entire responsibility of clean production upon the producer. Adequate icing during transportation can be supervised, and until the seal of that bottle is broken a purchaser should be guaranteed the origin of the milk.

At this meeting the Cambridge Medical Improvement Society voted unanimously to establish a Milk Commission of three physicians who should appoint a veterinarian, a chemist and bacteriologist, and should draw up suitable rules for the control of sanitary dairies and certify such dairies when their milk should come up to the standards set by the Commission.

Dr. Swan, the President of the Society, with Dr. F. W. Taylor and Dr. J. F. Fair, comprise the Commission.

A code of rules has been established and the Cedar Hill Farm of Miss Cornelia Warren of Waltham, already one of the largest and best farms in this region, has been improved as follows to meet the requirements of this Commission.

This dairy is more elaborately finished than others, which will accomplish as good results without so expensive an apparatus.

EQUIPMENT: A monitor roofed stable without a cellar was already arranged with two rows of tie-ups with feeding floors facing inward. One thousand cubic feet of air space is allowed each cow and an almost continuous line of windows fill the wall behind the cows.

A large wheeled push-cart is used to remove the manure and shavings used for bedding which sop up the urine.

THE DAIRY is a building with four rooms, a basement and an outside flight of stairs leading to a clean spout which conducts the milk into the clean room of the dairy.

This clean room has a cement floor and tile walls which can very easily be kept clean. In the room adjoining the clean room is a galvanized sheet-iron chest with a door opening the entire end of the chest so as to allow the entrance of a long truck laden with glass bottles, cans, pails, straining cloths and utensils in any way coming in contact with the milk. After the door is battened, live steam from a boiler in the basement is admitted for twenty minutes at 212 degrees Fahrenheit. Then after gradually cooling down, the utensils are stored in the clean room until wanted.

Each milker grooms his cows each morning, and immediately before milking rubs the udders and surrounding parts with a fine bristle brush to remove coarse hairs and dandruff. Then with a cloth wrung out of clean soapy water he washes off the above parts and dries them tidily with a towel carried in his pocket.

A chain is hooked across the stanchion below the cow's throat to prevent her lying down and dirtying the clean area. So soon as the milker's line of cows is cleaned and throat latched, he goes to the wash-room adjoining the dairy and cleans his hands with warm soap and water and puts on overalls and jumper kept solely for the milking process.

With one of the sterilized milk pans with a six-inch top opening he goes to the barn and sits upon a neat galvanized iron stool which is kept clean so that his hands are not polluted by the mere process of putting it in place for milking. The milking is done quietly and thoroughly. The yield is weighed and noted on the tabulated card; then a carrier takes this pail to the spout outside the dairy; the milker proceeds to another cow. The milk is poured through four layers of sterilized gauze into a hopper which leads into a tin milk tank in the dairy clean room. From this the milk goes directly into bottles, is capped and stood in chopped ice and water. This routine is now furnishing us with a milk with less than ten thousand bacteria per C. C. in these hot days just passed. The Commission feels sure that if eight certified farms can sell their entire production in New York City at fifteen cents per quart, a few such farms should be stimulated about Boston. The Briarcliffe Dairies of twelve hundred registered Jerseys are selling their entire product at fifteen cents per quart in

New York, and their cleanliness is rewarded by bacterial counts that seldom run over five thousand per c. c.

In response to petitions from the Cambridge Medical Improvement Society and the Cambridge Board of Health, the Mayor and City Council of Cambridge appropriated one thousand dollars through its Milk Department and an Advisory Board of five citizens to start a municipal Infant Feeding Plant during the hot summer months. We are fortunate in Cambridge in having a Nurses' Training School where enthusiastic young women are willing to clean and sterilize the bottles and prepare the milk for infant feeding. Also we have an efficient District Visiting Nursing Association whose young women have been willing to run the five dispensing stations for an hour each forenoon, and in case of well babies, without a physician's directions the nurses assign the food of suitable strength and outline to less intelligent mothers rules for the hygienic care of their little ones. A pamphlet aids largely in teaching and impressing on the mother's mind lessons given by the nurses.

At an early hour each morning milk less than twelve hours' old is brought from our certified farms to the training school where suitable admixtures of lime water, sugar, top milk and bottom milk are made and put into small sterilized feeding bottles holding two, four, six and eight ounces respectively. Sterilized cork stoppers close the bottles and they are put in wire racks set in deep wooden boxes and covered with chopped ice. At the present time we are dispensing 350 bottles to about sixty infants. At 8 A. M. these cases are distributed to the five delivering stations where the District Nurses are on duty from 8 to 9 each A. M. to sell at one cent or two cents, according to the size, these bottles of pure milk. On applying for milk the parent must either bring the request and directions of the family physician or must carry the infant and have it accurately weighed and its condition noted. Subsequently every three weeks the child is weighed and its progress noted upon cards kept for the purpose, and when needed the nurse may strengthen or weaken the feeding.

So far we have reached sixty infants scattered through all sections of our city, but chiefly in the poorer neighborhoods.

Simultaneously we have obtained one dairy with a maximum content of 100 cows, cleaned up to a high standard. The former bacterial counts of 200,000 to 500,000 and even more bacteria are now reduced to less than 10,000, and two other farms already very good according to old standards will in the near future be sending milk to the city from herds maintained in a reliable sanitary condition. In justification of this campaign we can merely say our State Board has pointed out the lines of needed reform and Cambridge is endeavoring to do her duty.

THE PRESIDENT: The next paper is by Dr. Morse of Boston. The subject: "The Projected Work of the Milk Commission of the Suffolk District Medical Society." I have the pleasure of introducing Dr. Morse.

THE PROJECTED WORK OF THE MILK COMMISSION OF THE SUFFOLK MEDICAL SOCIETY.

By Dr. John Lovett Morse of Boston.

A committee was appointed by the Suffolk District Medical Society to report upon the expediency of establishing a milk commission under the direction of the society. This committee consisted of Dr, Charles Harrington, Dr. Samuel H. Durgin and Dr. John Lovett Morse. They reported in part as follows:

"The attention of the public has repeatedly been drawn to the connection betwen ordinary market milk and the high rates of infant mortality, especially in urban communities, and the importance of a clean milk supply is now being recognized not only by the medical profession but by the more intelligent of the lay public.

While the producer of a clean, and, therefore, wholesome milk supply is put to greater expense in maintaining his plant, he competes on equal terms with the dealer in milk containing pus, cow dung and other contaminations, and receives the same price per quart. There are, in this immediate neighborhood, a number of persons who maintain scrupulously neat dairies and produce milk which is free from bacteria as constant care and watchfulness can make it, and doubtless, there are others who will go to larger expense for help in the running of their dairies were there any hope of public recognition of the fact that, even at a higher price per quart, clean milk is much cheaper in the end than dirty milk.

At present the public have no means of knowing of whom they can secure milk fit for human consumption, and, especially, adapted to infants during the perilous months of hot weather.

In a number of cities, both in this country and abroad, milk commissions have been appointed to issue certificates to those whose premises, cattle, methods of production and product conform to certain standards of sanitary excellence. The certificates issued grant permission to recipients to advertise the fact that their milk has been certified by disinterested persons as being produced under proper sanitary conditions, and conforming in chemical composition to established standards. The right, so given, is for a limited time only, at the expiration of which, further examination must be made in order that the certificate may be renewed.

In the belief that in no other way can the question of a pure, clean, sanitary milk be better promoted, however, and an improvement in the rates in infant mortality be secured, your committee recommends the appointment of a commission, to consist of not more than five physicians, to be known as the "'Milk Commission of the Suffolk District Medical Society.'"

It was voted by the society that such a commission be established. It was further voted, the members of such commission shall serve without compensation; they shall make such rules and regulations concerning certification as, in their discretion, they may deem proper; they shall fill any vacancies that may occur in their number; they shall make such arrangements to secure such competent gratuitous veterinary, chemical and bacteriological service as may be available; and they shall submit annually a report of their doings for the preceeding year.

The Chairman of the Suffolk District Medical Society appointed as this commission Dr. John Lovett Morse, chairman, Dr. E. P. Joslin, Dr. E. A. Locke, Dr. F. H. Slack and Dr. Wilder Tileston.

This commission, when it came together, found on looking the field over that there seemed to be three general ways of improving the milk supply of a community.

The first was by the establishment of such general rules and regulations regarding the milk supply of the city as could be taken by a State Board of Health or by a City Board of Health, and which improved the whole milk supply of the city; not making it ideal or even approximately ideal, but making it better. It seemed to the Commission that this field did not belong to them but did belong to the State and City Boards of Health. As you all know, of course, a great deal is being done by both the State Board of Health and by the City Board of Health of Boston to improve the milk supply of the city of Boston and also of the State as a whole.

Another way in which the milk supply could be improved seemed to be by the establishment of a farm under proper conditions and control, and the distribution of the product of that farm to poor people at a nominal sum, as is being done in Rochester and as is also being done in Cambridge as Dr. Norris described. It seemed to our Milk Commission, again, that that was not the best thing for them to take up at first; but that it should be left until later and then taken up if it seemed best.

The third method of improving the milk supply seemed to be by establishing rules and regulations for the production of milk and by the certification of the product of certain farms to get what might be called a perfect milk, that milk to be sold at a large price to people who were able to pay for it. Now, that of course is rather a limited field. It does, however, fulfill certain of the objects which are spoken of in the report of the committee. It furnishes an ideal milk. That ideal milk serves as an example to others as to what an ideal milk should be. It serves as an example to other farms and other milkmen and milk contractors, and more especially to the public, as to what proper, clean, ideal milk is. It also enables the public to get a proper, ideal milk, if they are willing to pay for it. It also educates the public up to a knowledge of the fact that you cannot get a clean milk without paying for it any more than you can get a first-class product of any other sort without paying for it. It is going to teach them that they cannot get milk for 8 cents a quart that is ideal. They have got to pay at least 15 and perhaps more.

After having decided to take up that line of work, there seemed to be two lines open. One was to make very definite, hard and fast contracts with one or more farms as to just exactly how that farm should be managed in every detail, as to the care of the milk and so on, as is done in Newark and certain other cities. The other way seemed to be to establish a high standard, so high that the milk would have to be produced under practically ideal conditions in order to fulfill the conditions of the standard, and then merely to certify the product, having only a general supervision over the production of the milk. It seemed to us that the latter was the better plan to adopt, and we have drawn up the following provisional requirements for certified milk; that is, the requirements have not been definitely settled as yet, but will probably be but slightly modified.

THE REQUIREMENTS FOR CERTIFIED MILK.

The Milk. The milk taken from the delivery wagon must fulfill the following conditions: 1. It must be free from pus and pathogenic organisms and contain not more than ten thousand bacteria to the cubic centimetre. (I would like to say here, parenthetically, that I wanted it 5000 bacteria to the cubic centimetre, but was voted down.) 2. The reaction shall be neutral or slightly acid. The milk shall contain not less than 3 per cent. nor more than 4 per cent. of proteids, not less than 4 per cent. nor more than 5 per cent. of sugar, and not less than 3.5 per cent. nor more than 4.5 per cent. of fat. (A uniform low standard for fat was established in order to provide a constant milk for the modification of milk for babies. It is probable that it will also be advisable to certify milk containing more than 4.5 per cent. of fat for the use of older children and adults.) It must be free from preservatives, coloring matters and other contaminations and it shall not have been subjected to the action of heat. The milk shall be cooled to a temperature of 45°F. within one hour of the time of milking, and shall be kept at this temperature up to the time of delivery; it shall not have been frozen. 3. Milk shall be delivered in glass jars hermetically sealed in a manner satisfactory to the commission.

The Dairy. The barn where the cows are kept, the dairy and the surroundings must be in a clean and sanitary condition satisfactory to the veterinarian employed by the commission. The cows shall be healthy and free from tuberculosis; each animal shall have been shown to fail to react to the tuberculin test both before its admission to the herd and at least once a year thereafter.

The employees shall be healthy and cleanly in their persons and habits. They shall not suffer from, nor have been recently exposed to, any infectious disease..

Inspection. The milk from each dairy certified by the commission shall be examined at least once each month both bacteriologically and chemically. Samples for examination shall be taken from the delivery wagon without previous notice to the proprietors.

In case an examination shows that the milk does not fulfill the conditions set by the commission ,the dairy may have a re-examination made within a week or within a short time, at the discretion of the commission.

Each dairy furnishing certified milk shall be inspected at least once a month by a competent veterinarian who is to make a report to the commission of the results of each visit.

Certification. If both the dairy and the milk it produces fulfill the foregoing requirements a certificate shall be issued to the proprietor of said dairy, good for the period of one month, said certificate to read as follows:

Certificate of the Milk Commission of the Suffolk District Medical Society.

(Date)

The Milk Commission of the Suffolk District Medical Society hereby certifices that the dairy of .... is now fulfilling all the requirements of the Commission both as to the methods employed and the quality of the milk.

This certificate is good for only one month from above date, when a new certificate will be issued if the conditions are still satisfactory to the Commission.

(Signed by the Commission.)

Each bottle of milk shall be accompanied by a certificate slip which shall serve as a guarantee to the consumer, said slip to read the same as the above certificate.

In order to prevent the copying or improper use of certificate slips they will bear a copyrighted monogram.

The certificate slip will also have these words "Notice the date!" If the consumer doesn't have sense enough to notice the date, it is up to him.

We have taken one or two stands rather different from the Milk Commission in other cities. In all other cities, I think, the producer has been compelled to pay for the examinations of the milk and of the farm, making the cost, I think, about $30 a month. That is going to cut a good deal into the profits of producing milk. The Milk Commission of the Suffolk District is not going to charge for the examinations. Through the courtesy of Dr. Harrington of the State Board of Health and Dr. Durgin of the City Board of Health, it is probable that the examinations can be made unofficially by persons connected with those boards of health ,and reported to the Commission entirely unofficially, through the courtesy of the gentlemen themselves and through the courtesy of their boards. The only thing for which the producer will be charged is the slips which go with the milk jars. Those I think will cost about a dollar a thousand.

It is very evident, of course, that the Milk Commission of the Suffolk District is taking a very arbitrary stand. That is, we say, "If you want to produce good milk, we are willing to certify it. If you don't want to, we won't." Now, we trust that there are certain people that will want their milk certified; and we trust that those people will be able to get a high enough price for their milk to make it pay to produce a perfect milk.

The PRESIDENT: The subject of these two papers is now before the Association for discussion. Some allusion has been made to the Association in Cambridge. I see Dr. Swan here, the chairman of that Association. We shall be glad to hear from him.

DR. SWAN: Mr. President,—I came here with no idea of saying anything about our Commission yet, but merely to listen and learn how it is best to conduct our affairs. Dr. Norris has shown you the interest that we feel in Cambridge in the subject of pure milk; and I will only say that our Commission is working on the same lines that Dr. Morse has outlined and that we hope soon to be able to show material improvement in some of the farms in regard to the production of pure milk.

The PRESIDENT: Dr. Slack, we should be very glad to hear from you upon this subject.

DR. SLACK: Mr. Chairman and Gentlemen: Dr. Morse, I noticed, divided his discourse into three heads, as to the way milk could be improved. First, by municipal and state control; secondly, by establishing certified milk depots; in the third place, by having a high priced certified milk.

Dr. Morse spoke on the last, Dr. Norris spoke on the second, the establishing of milk depots. My work has been connected more with municipal control, and I think perhaps a few words along that line would be more interesting to you than on the other matters which have been so fully described. In approaching this subject we find four general methods by which the milk supply as a whole can be greatly improved: The first way is to improve the production at the farms. The second way is to have milk cooled as quickly as possible and to keep it that way until it is delivered to the consumer. The third method is to insure as quick a delivery as possible to the customer; and the fourth way is to have great care taken of the milk with respect to its handling by the middlemen, those who handle it in the stores, etc. I believe that there is room for improvement on all these lines. Some of these methods which I will suggest for the improvement of milk are somewhat revolutionary in their character; but this is a subject of such vital importance that I believe we should be willing to revolutionize the existing conditions if by so doing we can save many lives. If, upon a grade crossing in a city, a single man is killed, the attention of the entire community is brought to the fact, and probably the railroad, at great expense, is forced to abolish that grade crossing.

But hundreds of children may be killed by impure milk, and very little attention is paid to the matter, because it is not brought so much to the public attention. I believe that just as much care and just as much expense should be used when necessary in order that these lives may be saved as that we may save life at grade crossings.

As to improving the production of milk, it is now possible for one man, by examining the dairies as they come in, to examine the samples from one hundred dairies a day and tell whether or not that milk is good. I believe that every dairy that comes into the city should be so examined. The contractors and those who have control of large supplies of milk should be constantly examining these supplies and weeding out poor dairies. For instance, nine-tenths of the milk that comes into the city now is in fairly good condition. Ninety per cent. of the milk, as it has been examined, coming from the contractors, is within our city standards. If this other ten per cent. could be weeded out before the milk is mixed, we would have a greatly improved milk supply. That is the first thing to be done.

As to keeping the milk cold, the city law upon that subject has had great effect in the city as a whole; the milk is now kept below 50 degrees Fahrenheit. But there is still room for improvement on farms. The milk is not cooled at once, but most of it waits for cooling on the cars. I believe if these dairies were examined as they come in, and the poor ones were notified that they would have to cool their milk in order to come within the requirements, there would be great improvement.

As to quick delivery, I believe there is room for improvement along this line. A very small per cent. of the milk as it comes to the city is delivered at once to the consumer. Most of it is mixed and packed away in ice for at least 18 hours. I have been told by the inspectors of other cities that in order to prepare for the increased demand for milk on Saturdays, it is customary to keep the milk another 24 hours, making from

48 to 60 hours before it is delivered. I believe, where there is no question but that this milk may be delivered and used by infants, such delay is little short of criminal. Even at great expense, and even, if necessary, by changing train schedules and things of that kind, this milk should be put on the market quicker.

The fourth point is as to the care of the milk in the hands of the middlemen. That is where the greatest reform should be made. We have, for instance, in Boston 3,800 licensed milk dealers. We can buy milk from the butcher, we can buy milk from the baker, from the grocery store, the candy store, the lunch room; we can buy milk almost anywhere. In some sections you can stand and see a dozen places within a radius of a few hundred feet where milk can be purchased. These stores are kept by all kinds and conditions of people. There are lots of good, clean, respectable people who keep their milk in a proper manner. There are lots of people who would like to keep their milk in a proper manner, and do not know how. And there are plenty of people who wouldn't keep the milk in a proper manner if they did know how. It is my personal opinion that the milk should be taken from all these stores, that they should not be allowed to sell milk. If, instead of that, say 100 or 200 milk stations were established throughout the city, where the milk would be under the care of people who knew how to handle milk, it would be a great advantage. If you could reduce the number of places where milk was sold to that number, they could be subjected to a rigid inspection by the Board of Health. These places could be visited almost weekly, and they could be forced to keep their milk as it should be kept. Keeping milk in this way would probably result in an increase in the bottle trade, and perhaps in a decrease in the amount of milk sold. But I believe it would be a great benefit to all concerned and would result in a decrease of the mortality rate.

The PRESIDENT: Everything that has thus far been said upon this subject points to a public control. The city of Worcester has given the control of its milk supply practically to its Board of Health, and our very energetic associate, Mr. Coffey, can tell us how they are doing it, I think.

MR. COFFEY: Mr. President,—I can hardly do that now, because the control has only just been turned over to us. The legislature of 1906, in the closing days of the session, passed an Act transferring the milk inspection to the Board of Health. Now we are interested, as a board, in finding out what are the reasonable requirements that we may ask without imposing unnecessary burdens on the farmers. The requirements, I mean, are with respect to what they shall do in order that proper milk may be sold at a reasonable price to the greater proportion of the community. Now 15 cents a quart or 20 cents a quart is simply prohibitive as far as the great bulk of the community is concerned. In Worcester the retail price of milk is 6 cents in summer and 7 cents in winter. And when milk dealers talk of raising it above that price, the people are very much concerned and restive and object rather strongly to paying more than 7 cents a quart for their milk.

Now, of course, the farmers have their side of the question. As an official, I want to do what I can to improve the milk supply of the city of Worcester and to make it as nearly pure and healthful as it can be made. And, at the same time, I recognize the fact that the farmer has his side of the question. Personally, I do not believe there are any people in the community who work harder, more hours, in all kinds of weather, than the milk pedler in the average city. You must remember that outside of Boston the milk of the various cities is supplied by the surrounding towns. In Worcester the milk is almost entirely supplied in that way, by the men who produce it themselves or who purchase it from their neighbors. These men get up at midnight or one o'clock in the morning and collect their milk, and by three o'clock they are on their way to the city. They are in the city by half past three or four o'clock. And any one who is driving along the roads leading from the city—this is true of Worcester, and I haven't any doubt it is also true of the smaller cities of the State and perhaps of all the cities with the exception of Boston which gets its supply from distant points by railroad—in the smaller cities, anybody who has been about on the roads leading out of the city along about ten o'clock or half past ten has seen the milkmen on their wagons, asleep, and the horse proceeding on his way homeward. It is eleven o'clock or perhaps later when that milk pedler reaches his home. Then he has got his ordinary duties to perform on the farm; and he must be in bed by seven or eight o'clock at night in order to get a small amount of sleep. He is out in all sorts of weather, rain, wind and sleet and snow and ice. And I think that he has a side of the question. My interest is, to find out what are the reasonable requirements that we may exact from the milkmen, and at the same time protect ourselves. In other words, what ventilation ought a dairy barn or a cow barn to have, what are the conditions, how many cubic feet of space should be allowed to each cow, what should the conditions be with respect to the flooring, what should the conditions be with respect to light; I mean, the conditions that are reasonable, not ideal. We all know what the ideal conditions are, or at least we can imagine what they might be if we had unlimited money and there was no question as to the cost of the production. But the thing that I, as an executive officer of the Worcester Board of Health, am interested in, is, what may I say to a dairyman that produces the milk that comes into Worcester, that he cannot object to as a reasonable requirement. That is one of the things that I am particularly interested in.

Another thing that has suggested itself to me is the question whether 500,000 bacteria to the cubic centimeter are too many to allow? Those who have had the matter in their charge longer may perhaps be able to answer that question. Can milk be produced under reasonable conditions, not at too great a cost, so that it can be put into the city with a less number of bacteria than 500,000 to the cubic centimeter?

What are the reasonable requirements that we may exact of store-keepers who have milk to sell?

Those are the practical questions that, as a health officer, I am interested in. What can we reasonably ask of the producer and the distributer in order that we may have pure milk without putting burdensome conditions upon him that will necessitate his putting the milk at a price that places it beyond the reach of the average family? If there are any here who have had that experience and can answer those questions, I should be glad to hear from them, because those are the things that I am interested in,—not so much in the ideal conditions, because the people who can afford to pay for ideal conditions can be trusted to take care of themselves as a rule. It is the great bulk of the people, the poor people, to whom an extra cent a quart for milk a day is a burden, who are to be considered. And all we expect to require, all we should require, it seems to me, as public officials, is that the milk shall be furnished reasonably clean and pure and that reasonable precautions shall be taken by the producer and by the distributer in order that the people may have that most important of all foods, pure milk.

THE PRESIDENT: No one has had more to do with voluntary association for the protection of our food supplies than one of our members now present. I am going to ask Mrs. Richards to say something to us upon this subject.

MRS. RICHARDS: Mr. President,—in regard to this question, I think a great deal of the difficulty at present is owing to the fact that the care of the milk supply at the farm has been taken naturally, in the large way in which milk is furnished, from the care of the farmer's wife and put into the hands of the farmer's hired man. So I should say the first thing to do is to encourage an oversight from the woman's point of view in the way of cleanliness. I feel with Mr. Coffey, very strongly, that we are putting a great burden upon the people in charging such a high price for milk, and that a little more care, a little more cleanliness in the dairy, will go a very great way. And I believe in a campaign of education among the farmers, as to the way dirt affects the milk, and especially in the encouragement either of the farmer himself or of the farmer's wife to look after some of these details. That is the main line that I feel we can work for in the country towns. Many failures are entirely from ignorance. The people have no idea where the difficulty lies. And, of course, we must use every possible means of spreading our belief in the value of clean milk. I am sure the farmer will meet the people halfway if he can be shown, as Mr. Coffey says, how to do it. And then the rest of us in the cities must be educated up to paying a fair price. And there I must say I think the housewife should be educated. She should be educated to know what is really worth paying for, and pay for it, in this line as well as in any other. We make nothing of paying a high price for cream; and we ought to learn, I think, what really clean good milk is worth.

THE PRESIDENT: There is one man fortunately in this hall who knows more about milk probably than all the rest of us put together. He has analyzed more milk and seen more milk than any of us. And that is the milk inspector of the city of Boston. I am going to ask him to answer some of these questions,—Mr. Jordan.

MR. JORDAN: Mr. President,—Here in Boston our trouble at the present time is mainly due to two conditions: One is a few very bad dairies; and the other is the age of the milk. But we have a problem which is different from that of most cities. Our milk comes from a wide range of territory. We have milk arriving here from New York, Vermont, New Hampshire, Maine and Connecticut, besides that produced in this State. And it is a difficult problem even for the contractors to have control of all the farms producing this milk, especially when they are located outside of Massachusetts. However, I think that we are making progress, and these movements for certified milk are for the betterment of conditions. I believe there will be no trouble in getting certified milk when the public is willing to pay for it. But at this time I do not think that enough individuals will purchase it to make its production a financial success.

One great difficulty in Boston is with the store milk. The milk from wagons comes fairly well within the requiremnets of the Boston Board of Health. But the store milk is the oldest milk and has the most handling. It is turned from cans the outside of which may not be over clean, into milk crocks, and is subjected to conditions of dust and dirt in the store, which tend to make it poor. But I think we are making improvement along that line, and within a few years anticipate greater progress. I believe that in a short time many of the small stores where one or two 8 1-2 quart cans are sold daily, milk will be retailed in bottles, and it will be left with the storekeepers by milkmen in bottles, quarts and pints, and that the store people will sell this bottled milk to customers, instead of measuring out the milk as at present.

I agree with Mr. Coffey that the milk dealer is a very hard worked individual; and I also want to call attention to the fact that the milkman of the present day is very different from the old-style milk dealer. Many of the former milk dealers have been driven from the business. Their methods were not such as to commend their product to citizens; and they were law violators. But at the present time many of the dealers supplying Boston with milk are progressive men; they are trying to improve their product and I believe they are giving the citizens a better article of food than formerly.

I think this movement for certified milk is a very good one and I hope there will be no difficulty in coming within the proposed standard for bacteria.

THE PRESIDENT: Dr. Peters, I think you are the man to tell us something about the condition of the cow in Massachusetts, which is responsible for this business.

DR. PETERS: Mr. President and Gentlemen.—I came here to-day to listen and learn, not to speak. I think we shall be glad to hear from the farmers' side of the question; and we have the largest cattle owner in Massachusetts here, who conducts one of these model dairies, and I would like to give way to Mr. Geo. H. Ellis, who is producing milk under the ideal conditions that have been spoken of with respect to having healthy cows, keeping them clean and cooling the milk which is drawn from the cow and putting it in glass bottles and delivering it directly to his customers without the intervention of the middleman. I would be very glad to give way to Mr. Ellis.

THE PRESIDENT: Dr. Peters has, in a very cowardly fashion, escaped from his responsibilities. I was going to call upon Mr. Ellis, myself; but I do not propose that Dr. Peters shall shelter himself behind any such ignoble excuse. We shall be very glad indeed to hear from Mr. Ellis and very glad to hear from any of our friends who are producing milk.

MR. GEORGE H. ELLIS: Mr. President, I am sorry Dr. Peters should have turned the subject over to me, because I think he could give more information perhaps than I could. He says I am producing milk under ideal conditions, and I do not plead guilty to that. I am trying to, but I find how difficult it is. And it seems to me that just now the thing that needs to be taught our people more than anything else is the absolute necessity of paying a higher price for milk. You are asking the farmer to supply his milk at practically the same price; you are asking the retailer to supply it at exactly the same price as he has been doing in our cities for years; and yet the cost to the producer is tremendously increased. We have had the cry—and it was a legitimate one—for years past, that the farmer could not live on the price he was getting for his milk. And yet you are asking him to take the same price to-day, when every expense has gone up.

Mrs. Richards speaks of the transfer of the care of the milk from the farmer's wife to the hired man. But that is coming back pretty fast, for you cannot get the hired man. If the farmer's wife does not take care of the milk, it won't be taken care of. The help problem is a very serious problem on the farm; it is practically impossible to get men who will take proper care of milk. If we reach the point that we seem to be nearing now, of the milking machine, that is going to help very materially to settle the whole question,—not the whole question but the producer's question, because, if the milk machine is as satisfactory as has been promised, it will largely take care of the question of bacteria, with reasonable care only of the cow. Now it takes what the old farmer would consider and does consider unreasonable care, to give us the milk that we want. And that does cost him a lot of money. The milking machine is going to cost money, it is true. But if that comes into use, as now seems probable, I think the production of milk will gradually drift away from the small farmer and from the man who is producing his one or two or three cans under what you would call normal conditions, to the larger producers, because the milking machine can hardly be run to advantage with a small herd of cows. But with a herd of fifty and upward, if it works satisfactorily, you have removed this danger of contamination, providing your cows are reasonably well taken care of, and have reduced the cost of handling that milk from the cow to the consumer very materially. I say reduced it,—no, I don't know that I would say that, because when you come to the use of milking machines, you have got to have a higher order of intelligence, if not of cleanliness, in the handling of the machine and in the handling of the cows. But while the cost, as against the present cost, may not be reduced, the cost of producing milk that is at least reasonably pure will be reduced.

But, as I say, one of the first requisites is that the farmer shall receive a reasonable price for his milk. Now, while I am, as Dr. Peters intimated, trying to produce a strictly sanitary quality of milk, I am more interested in the production of milk along the line outlined by Mr. Coffey, the milk that is to be used by the ordinary people. And I have found from experience that it is impossible to produce and sell milk under such conditions as I am producing it, of the quality that we are producing, and sell it in our immediate vicinity for less than ten cents a quart. Now, I am making, as some of you know, a high grade of milk, averaging about five per cent. butter fat. Whatever may be said and whatever has been said by some specialists to the contrary, that does increase the cost of your milk. You cannot make a five per cent. milk at the same price, other conditions being equal, that you can a four per cent. And I think it might be possible to sell a milk in the neighborhood of four per cent. in one's own vicinity for less than ten cents a quart. I don't believe that with such care as most of you gentlemen would call proper care, that milk can be sold under such conditions as we are laboring under, at much less than ten cents. I should say that in our smaller cities, in the vicinity of good dairy farms such as we have near Worcester, possibly that price might be reduced a little. But if the food value of milk is what our scientific men claim for it, then why should we not encourage the paying for that milk a price somewhat commensurate with the same food value in other things? And when you get there, then your producer can afford to produce it, and your middleman can afford to handle it. But you must pay for milk somewhere near what it is worth for food, and then encourage its use; increase the care, give us pure, clean, wholesome milk and encourage the larger use of it against the higher priced foods. You can then produce and sell, on the larger output, at perhaps a less price than you can now. But do not kick the farmer. Pay him a fair price for his milk, and he will come up to your requirements.

THE PRESIDENT: The Association, I know, would be very glad to hear from any other of the many producers who happen to be present. I do not, myself, know them all by name, but I hope some of them will volunteer to say something upon this subject.

MR. HOOD: Mr. President:—Since I have listened to what has been said about ideal milk production I have been thinking of the condition of milk twenty or twenty-five years ago. I remember very clearly, about twenty-five years ago when the weather was extremely hot, perhaps something as we have had it for the last ten days, coming to Boston from New Hampshire on a milk car, and there waiting on milkmen or milk pedlers. The milk supply was short at the time, as it is likely to be during extremely hot weather, and about noon or nearly time for the car to leave Boston, a large dealer in milk came to our car to ask if we had any milk—rejected milk or milk of any kind which we were to take back into the country. We had some rejected milk left, and I remember very clearly my surprise when he bought the entire quantity, learning that it was not bonny clabbered.

The cream was quite thick, and this he turned from the top of the cans into a separate can, making cream for his cream trade, whatever that trade might be. The remainder of the milk he put in other cans, adding a preservative in the form of a powder, to which I think coloring matter had been added. He also added water enough to make a solution to satisfy his idea of milk. That milk, of course, went by his delivery team to his customers in Boston; that is, he delivered it to the stores, and from there it was without doubt sold to be given to many babies.

The condition of the milk in the market to-day is entirely different. I wish you could see the difference as I see it. We come here to-day and talk about ideal milk. But the ideal of to-day will not be the ideal of tomorrow. If, twenty or twenty-five years ago, any dealer had put out or delivered to his customers the milk that is being delivered to-day, we really would have thought people would live forever. The change is coming gradually, and there is a great deal of credit due to the Board of Health and to the inspectors of Boston and vicinity. I am pleased to attend such a valuable meeting, and those interested in the milk business will also be interested in what has been said here to-day, and in carrying into their own business the thoughts and ideas which you have advanced.

MR. S. C. KEITH: Mr. President, there is one point that has not been brought out to-day as yet I believe and that is the fact that the greater part of the milk consuming public are poor people who buy milk in stores and from wagons and who do not take proper care of it after they get it. Very many poor people to-day are not buying ice at the existing high prices; and they buy milk which may be perfectly good when they get it, and feed it to their babies for the ensuing twenty-four hours during which time it must, of course, become unfit for food. It seems to me a great deal of good work could be done by instructing the general public through boards of health and physicians, to take proper care of the milk after they receive it so that it may be kept in good condition for use until the next supply is bought.

MR. WHITAKER: Mr. President,—considerable has been said about the work of the State Board of Health and the City Boards of Health. But it may not be known to all the members that even the National Government is taking considerable interest in the milk supply of the country, and, through its dairy division, is doing quite a little work along that line. At the recent dairy exhibition in Chicago there was a competitive exhibit of samples of milk, similar to the butter exhibit that has been held a great many times. Samples of milk from various parts of the country were exhibited. And, if my memory serves me right, a Massachusetts sample took one of the honors, a sample presented by Mr. Hood, who has spoken here to-day. The national dairy division is also doing something to help the milk question by investigations in different cities and by the publishing of bulletins, so it is possible for the people of one city or state to know something of the work that is being done in other states and other cities, acting as a sort of clearing house of information, as it were. There is just now going on in Pennsylvania a work of so much importance that the national dairy division has undertaken, in a way, a sort of inspection or supervision of it for the good of the cause generally, which is of interest possibly. A corporation of milk consumers has been organized in the city of Bradford, Pennsylvania, for the purpose of supplying themselves with milk under ideal conditions; and, without going into the details at all, they propose to buy the milk of such farmers as will produce milk under ideal conditions; and to act through their executive officers as middlemen under ideal conditions. And what profits there are will go to them in getting a perfect milk supply. The proposition is somewhat altruistic possibly; but it is so novel that the national dairy division has thought it wise to have an eye out to see what it amounts to; and, if it amounts to anything, it will publish information about it for the benefit of the people of the country generally.

THE PRESIDENT: The next paper in order is a paper upon the "National Pure Food Law and Its Possible and Probable Influence upon the Food Supply of Massachusetts," by Dr. Charles Harrington of Boston. Dr. Charles Harrington is not able to be here this afternoon, and Dr. Magrath will read his paper.

THE NATIONAL PURE FOOD LAW.

By Dr. Chas. Harrington, Secretary Massachusetts
State Board of Health.

THE NATIONAL PURE FOOD LAW which is to go into effect on January 1, 1907, deals not only with foods, but with drugs, proprietary medicines, and liquors; and not only with adulteration of the same, but with misbranding. Inasmuch as the States have the right to make their own police regulations in regard to the manufacture and sale of food and drugs within their own boundaries, the provisions of the act apply only to those articles which enter into interstate and foreign commerce and to those produced and intended for sale in the District of Columbia and the several Territories and insular possessions. It does not and cannot interfere with the sale of adulterated and misbranded foods and drugs within the boundaries of the State in which they are produced; but it does prohibit the manufacture, sale, or offering for sale in the District of Columbia or Territories, of adulterated or misbranded foods, drugs, medicines and liquors, and the shipment thereof from or to any State, Territory, district, or foreign country; and imposes heavy penalties—fines, imprisonment, or both—for the violation of its provisions. And any person, who, after receiving such goods from another State, Territory or district, or foreign country, delivers or offers to deliver the same in *original unbroken* packages, or sells, or offers to sell in the District of Columbia or any Territory, or exports or offers to export the same to countries in which their sale is prohibited, may be punished by fine or imprisonment or both.

While the sale of these articles at retail or wholesale is prohibited where Congress has exclusive jurisdiction, it is only in original unbroken packages that their sale is prohibited within the several States, and then only in the States within which the same are *not* produced. Thus, adulterated maple sugar, produced in New Hampshire, may be sold at wholesale and retail in New Hampshire without breaking the National law, and if introduced into Massachusetts and removed from the original package it may be sold at retail without violating any of its provisions, though contrary to the State law; but it may not be disposed of in Massachusetts in the original package without breaking both laws, and also it may not be exported to a foreign country.

In case of violation of any of the provisions of the law, the results of the examination made under the direction or supervision of the Bureau of Chemistry of the Department of Agriculture must be communicated to the person from whom the sample was obtained; and he may be heard, under such rules and regulations as may be prescribed by the Secretaries of the Treasury, Agriculture, and Commerce and Labor, to whom the carrying out of the provisions of the law is entrusted; and if the Act appears to have been violated, the facts must be certified to the proper United States District Attorney for prosecution without delay.

The Act defines drugs as all preparations included in the United States Pharmacopœia and National Formulary, for internal or external use, and any substance or mixture of substances intended to be used for the cure, mitigation, or prevention of disease of either man or animals. It defines foods as all articles used for food, drink, confectionery or condiment by man or animals, whether simple, mixed, or compound.

A drug is deemed to be adulterated, if when sold under a name recognized by the Pharmacopœia, or Formulary, it differs from the established standard, except that its true standard may be stated on the label, even though not in agreement with that of the Pharmacopœia or Formulary.

Confectionery is deemed to be adulterated if it contains any barytes, terra alba, or chrome yellow or other harmful color or flavoring material, or any spirituous or vinous liquors, or any narcotic drug.

The definition of adulteration so far as relates to foods is practically the same as in our own law, except that in the matter of preservatives, the National law permits their use only in such a way that they can be removed mechanically or by maceration or otherwise before the food is used; and the directions for removal must be printed on the package or on its covering.

A very important part of the law is that which relates to misbranding of foods and drugs; that is, labelling a package in such a way, by statement, design, or device, that the customer will be misled in any particular, including even statements concerning the State, Territory, or foreign country in which it is manufactured or produced; and neither food nor drug may be sold under the name of another article, or if any part of the contents of the package has been removed and replaced with something else, or if the label fails to state the amount and proportion of any alcohol, morphine, opium, alpha or beta eucaine, cocaine, heroin, chloroform, cannabis indica, chloral hydrate or acetanilid or any derivative or preparation of any such substance contained therein.

Foods containing no harmful substances, but yet adulterated in the ordinary sense may be sold if marked "Compound", "Imitation," or "Blend." This proviso is evidently intended to meet the objections of the makers of blended whiskey, who have been strenuous in their opposition to the bill from the very first. The clause containing this proviso says that a "blend" means a mixture of like substances not excluding harmless colors and flavors.

As with our own law, the disclosure of trade secrets is guarded against, and no formulas of proprietary foods are required, except in so far as they may be necessary to secure freedom from adulteration or misbranding.

It is provided that no person shall be prosecuted if he can establish a guaranty signed by a wholesaler, jobber, manufacturer, or other party, residing within the United States, from whom the article in question was purchased, to the effect that the same is not adulterated or misbranded; and then the maker of the guaranty becomes amenable to the law.

It is further provided that any adulterated or misbranded food, drug, or liquor, in transit from one State, Territory, the District of Columbia, or insular possession to another, there to be sold, or, having been transported, remains unloaded, unsold, or in the original unbroken packages, or for sale or offered for sale in the District of Columbia, or territory, or insular possession, or imported from a foreign country for sale, or intended for export, may be seized, confiscated and condemned, and be destroyed or otherwise disposed of.

It will be observed that in no way does this bill conflict with the State law or render the same inoperative in any particular. So far as foods are concerned, its tendency will be to prevent the introduction of adulterated goods from outside the State. In a way this is hardly necessary, inasmuch as our own law prohibits the sale, after introduction; but though not strictly necessary, it can be helpful.

The most important portion of the law, so far as Massachusetts is concerned, is the very admirable provision relating to the labelling of patent medicines. Herein the law goes much farther than that which was enacted by our own Legislature this year, in that no amount whatever of the drugs mentioned may be present and not declared on the label; whereas in our own law, not inconsiderable amounts of morphine or opium, and large amounts of alcohol may be present without notification. The National law will bear down hard upon "Peruna" and other alcoholic beverages which masquerade as medicines. It is pleasing to note that acetanilid is included among the drugs whose presence must be made known on the label. In view of the fact that acetanilid preparations are extensively advertised, and samples are distributed from door to door like handbills and other advertising material, and of the further fact that the death-roll from the use of these compounds is increasing all the time, it may be said that this clause of itself makes the law worth while.

In its original form the pure food bill was not all that could be desired, and gave rise to feelings of apprehension that local authorities might be interfered with in the exercise of their duties. In the form in which it was finally passed, it would appear that all of the original objectionable features have been eliminated. Instead of being hampered in its work, the labors of the State Board of Health may be lightened by having a smaller amount of adulterated goods from outside the State to look after, and in the matter of patent medicines, the State is a very great gainer.

THE PRESIDENT: Is there anything to be said upon the subject of the paper that has just been read to you?

DR. DURGIN: A member of the Association has sent a question, asking me to read and answer it. I would consent only from the fact that it can be answered with considerable brevity. Certainly so far as I am concerned I should make it brief. The question is:

"In view of the serious nature of the disease, why should not needy patients ill with advanced pulmonary tuberculosis, who go to a hospital for the protection of the public health, be exempted by the Public Statutes from pauperization if they cannot pay the charges for such hospital care, just as patients with diphtheria or scarlet fever in like circumstances are exempted?

"Second, if it is just and expedient that advanced tubercular patients should receive the same exemption from pauperization under the same circumstances as diphtheria and scarlet fever patients receive it, should not this Association take the necessary steps for securing the requisite legislation?"

Personally, I see no reason why the tubercular patient in an advanced stage, obliged to go to the hospital, should not be as free from pauperization in consequence of such hospital treatment as a person suffering from any other infectious disease. I can conceive of a question being raised in the community as to whether it is worth as much to spare a tubercular patient from pauperization, considering a smaller degree of menace to the public than from a diphtheria or scarlet fever patient,—I can conceive of such a reason being set up. I doubt, myself, the reasonableness of this objection. Yet, if legislation is sought, I think it would be much safer to put the immunity upon those who are obliged to go to the hospital under the order of the Board of Health.

Inasmuch as this is a representative body of men who will have to deal with this question,—I see no reason why they should not express their views, and, if necessary, appear before the legislature in behalf of such legislation.

DR. DAVENPORT: Mr. President, I would like to ask a question. It was my impression that a person was not pauperized who received help from a hospital unless he received help from a fund especially devoted to use as a poor fund. If he received help from a hospital or from any other appropriation made for the Board of Health, it was my impression he was not pauperized. It is my impression that is the law.

DR. DURGIN: I am not prepared to speak positively upon the question raised, but it is my pretty firm belief that all become pauperized if aided by any town or city funds.

MR. COFFEY: Mr. President, I want to say that I do not think there is any question but that these people are pauperized, whether they are aided by the Board of Health or by the Overseers of the Poor; because we have at Worcester a hospital under our direct control, for the care of diphtheria and scarlet fever patients; and until that Act was passed eliminating those patients from being pauperized, they were pauperized and were carried on the books as paupers. I had a hand in getting that Act passed because I believed that it was unfair to remove those patients to an isolation hospital for the benefit of the public and thus pauperize them. But they were pauperized. And they were aided by the Board of Health directly and out of the Board of Health appropriation. They were pauperized until that Act was passed which prohibited their being pauperized.

MR. NEWCOMB: Mr. President,—does not the law state that it is incumbent upon the Board of Health to provide for the protection of the health of the community by taking care of a person who shall become ill with a contagious disease, by providing a hospital and nurse? Is it not incumbent upon a physician, when he goes to a case of infectious disease immediately to report it over his signature, and for the householder to report the same, under penalty? And does not the law distinctly state that whenever a patient is suffering from a contagious disease dangerous to the public health, special provision shall be made for his care, which shall be at the expense of the individual or of the city or of the town where his settlement is; or, if there be no settlement, then it is a State case? Does not the law particularly state that the expense incurred by the same does not pauperize? I do not know where that law has been repealed. That is the thing in a nutshell, it seems to me.

MR. COFFEY: Worcester has been working under State laws. And, as Mr. Newcomb has just said, the law distinctly says if any one is aided by a city or town, he is aided by the city of town in which he has a settlement. If he has no settlement in the city or town in which he is aided or in any other city or town, then the State pays the bills, and he is pauperized. That is State law. It is not confined to Worcester or any other particular town or city in the Commonwealth.

It is the State law. It says they shall be aided at the expense of the city or town in which they may have a settlement. And if they have no settlement in any city or town of the State, then they are aided by the State; and they are put on the books of the State Board of Charities, and they are put on the books of the Overseers of the Poor of any city or town, if they comply with the law, as paupers. And when the diphtheria and scarlet fever patients were aided by boards of health, they were put on the books as paupers till that Act was passed some four years ago which prohibited their being pauperized.

DR. CHASE: Mr. President, I was wholly of the opinion of Mr. Newcomb, that a tubercular patient in an advanced stage, who was taken to the hospital, either forcibly or voluntarily, would not be pauperized under the Public Statutes. The matter was carefully looked into by officers of the Board of Health of Brookline, and I think in some other places. I won't go into that now. This matter ought to be settled. We ought to find out who is right in this matter. Personally, I believe Dr. Durgin is wholly right. But to bring the matter before us, a matter in which we are all interested, I move you, Mr. Chairman, that a committee of, say, three, appointed by the Chairman, be appointed to take up the subject matter of the question stated by Dr. Durgin, and report at a later meeting to this Association; and let them take up the matter early enough to get any legislation that may be necessary to put a tubercular patient in an advanced condition, in the same class as to pauperization as a diphtheria or scarlet fever patient.

The motion was seconded and adopted.

MR. COFFEY: I move that the Chairman be added to that committee.

The motion was seconded, was put by Dr. Durgin and was unanimously carried. The president announced the names of the committee, as follows: Dr. Chase, Mr. Coffey and Dr. Durgin.

DR. CHASE: Mr. Chairman, I desire to withdraw in favor of the president of the Association.

THE PRESIDENT: He is already there, unfortunately.

DR. CHASE: I thought it was to be a committee of three; and, it is so much easier for a small committee to accomplish such things, I would like to have it made three, and retire in favor of the president of the Association.

THE PRESIDENT: No, there will be no trouble. It is a committee of four, and we have got to fight it out.

Is there any other business to come before the Association at this time?

(Adjourned.)

MUNICIPAL SANITATION.

By Charles V. Chapin, M. D.,
Superintendent of Health, Providence, R. I.

SOME ENGLISH NOTES. It is a curious fact that while almost all English public officials hold office during good behavior and are subject to civil service rules, it is otherwise with health officers. With very few exceptions their term of office is for one year. In the large cities, however, public sentiment is so in favor of retaining a good officer that such officials hold office as long as they like. But in small towns and rural districts a single landowner often has enough influence to secure the defeat of a health officer who has caused offense by the discharge of his duty. A bill is now before Parliament to remedy this evil. Salaries are rather higher than with us. The highest in England, $6,000, is paid to the health officer of Brighton. The health officer of Bristol, with a population of over 300,000, receives $4,000.

In England the Local Government Board has much greater control over local sanitation than have the state boards with us. In the large cities, however, the local officers are not often interfered with, though there are a number of absurd restrictions relating to hospital construction, drainage, etc. Thus the local government may and does prescribe such details as the size of hospital closets and the kind of fixtures that shall be put in bath rooms. It appears that this central control tends in the large cities to stifle progress, for the local official who devotes his whole time to his work is more likely to know what is best, than officers at a distance who are not directly occupied in local administration. In rural districts on the other hand the inexperience of the health officers demands the advice and control of the central board.

Contagious disease hospitals are much more common in England than with us. Nearly every city is provided with one and rural districts often combine to establish a common hospital. Then, too, more beds per population are provided, one to each 1000 of the population being recommended and often furnished. The air space per bed, 2000 cubic feet is more than is common in the United States, and for this reason and because of the more substantial and finer construction, the expense is greater, being often $2,000 to $2,500 per bed. The lower cost of land in the United States is more than offset by the higher price of building materials. As might be expected every effort is made by the use of plane surfaces and rounded edges to prevent accumulations of dust, but it is rather curious to see in some hospitals rugs on the floors and carpet-backed easy chairs.

Much less attention is paid to the carrying of infection than with us. The nurses do not wear gowns at their work but go directly from their wards in their ward clothes, to common eating and sitting rooms. Scarlet fever and diphtheria nurses live together. Physicians as a rule do not wear gowns and in only one hospital was I as a visitor, requested to do so, and then it was only for moral effect. In one hospital which I visited different diseases are treated in the same ward, though in separate rooms, and the nurse passes from one to the other, the only precaution being the washing of the hands if the patient has been touched. I cannot find that cross infection occurs any more often than with us but as statistical data are wanting on both sides of the water it is impossible to be sure of this. Accurate statistics of infection in hospitals would throw much light on the mode of transference of the contagious diseases. Many English health officers do not attach much importance to aerial infection. On the other the local government board believes that small pox infection may be conveyed a mile or more from a hospital, and hence require all such hospitals to be in a very isolated place. In one of the large London hospitals when it is time to discharge a diphtheria patient a bath is given, fresh sheets put on the bed and the patient kept in the ward over night before discharged. Cases of typhoid fever are usually treated in contagious hospitals though, of course, in separate wards.

Patients with scarlet fever and diphtheria are usually kept in the hospital longer than with us. Most of the English health officers that I have met do not attribute any importance to desquamation as a factor in infection. The secretions from nose and ear are believed to be contagious and patients are not sent home while there is any appreciable nasal discharge. The average detention in the hospital is over eight weeks. It is only within a year or two that the London hospitals have made it routine practice to require cultures before the release of diphtheria patients. Since this has been required it has been found that the bacilli usually disappear by the end of the first month but most of the patients are not fit to be discharged for another month. As plenty of antitoxin is used it is not unlikely that a more severe type of diphtheria prevails in London than with us. This possible variation in the type of the disease reminds me that Dr. Davies found a peculiar form of diphtheria bacillus for some time in one of the suburbs of Bristol, just as Hill in Boston, Gorham in Providence and Amyot in Toronto found different types of the organisms in different localities.

VETERINARY SANITATION.

By Veranus A. Moore, M. D.,
Cornell University, Ithaca, N. Y.

MILK AND DAIRY PRODUCTS AS SOURCES OF INFECTION IN TUBERCULOSIS. Muller* has contributed a valuable article on the vexed questions pertaining to the extent of human infection of tuberculosis from milk and dairy products. He summarizes his findings as follows:

1. "The infectivity of milk and its products, provided the contamination of these by means of the feces and excreta of tuberculous animals has been excluded, is mainly referable to tuberculosis of the udder. Cows not affected with udder tuberculosis do not excrete tubercle bacilli, or at least not to any considerable extent."

2. "The transmission of tuberculosis is effected, in the first place, through the milk of cows with udder tuberculosis. In addition, the milk of clinically tuberculosis animals, and of those in which the disease has reached an advanced stage, although the udder is not involved, are capable of causing infection; and this in no slight degree may be ascribed to a contamination of the milk with feces and excreta. Contrary to what is the case with milk from tuberculous cows whose udders are not affected, the infectivity of which is nearly entirely abolished by dilution (as in ordinary mixed milk), the milk of cows affected with udder tuberculosis retains its pathogenic power after even the strongest dilution, and this warrants the conclusion that cows with udder tuberculosis are solely responsible for infection by means of such dairy products as butter, cheese, and butter-milk.

3. "Infection by milk and dairy products is particularly

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* Jour. Comp. Path. and Therapeutics, Vol. xix., p. 19.

frequent in districts with a large dairy industry, especially in calves and pigs. In pigs it often leads in a short time to a progressive tuberculosis, and, since experience indicates that there are practically no other sources of infection for these animals it acquires a great importance. Even in the care of calves and adult cattle the danger of the transmission of tuberculosis through milk and dairy products cannot be declared slight, although here it does not occupy a place of the first importance, as it does in the care of pigs.

4. "There is also a danger of the transmission of tuberculosis through milk and dairy products (butter, butter-milk, etc.) to human beings, but at the present time it is impossible to say what is the extent of this danger.

5. "To avoid the danger it is necessary to eliminate all cows with udder tuberculosis and all otherwise clinically tuberculous cattle, and to observe the greatest care and cleanliness in order to prevent contamination of the milk with the discharges of tuberculous animals. As a further precaution, milk and dairy products, before they are issued from the creameries, ought to be heated to 85° C."

SEWAGE POLLUTION OF DRINKING WATER AS A CAUSE OF DISEASE IN ANIMALS. Much interest is attached to verdict given in an action before the sheriff-substitute in Ayr, Scotland, in which the plaintiff was awarded 200 pounds damages and costs for damages to cattle caused by drinking from a polluted water supply. The specific damage charged was that the contaminated water produced abortion in the cattle as well as causing diminution in the quantity of milk secreted. The decision seems to have been rendered on the statements of two distinguished professors that the cows had been poisoned by the bacteria in the water. There seems to be some difference of opinions on this subject. However, the case is an important one, calling attention to the desirability of pure water for domesticated animals.

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THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH was organized in Boston, March, 1890, *with the following objects: The advancement of sanitary science; the promotion of better organization and co-operation among local boards of health, and the uniform enforcement of sanitary laws and regulations.*

THE JOURNAL OF THIS ASSOCIATION has for sixteen years faithfully reflected the views of the public hygienists of Massachusetts. With the November issue of the year 1904, *the encouragement received from many hygienic quarters induced the Association to undertake the expansion of the Journal to a national standard, with the co-operation of many noted sanitarians as editors. A new title was selected, while the older and well-established title was retained also.*

The dates of publication are FEBRUARY, MAY, AUGUST and NOVEMBER of each year.

THE JOURNAL will contain the papers read at the meetings of the Association, papers contributed by hygienists, report of the discussions, editorials, abstracts, reviews and hygienic notes of professional interest. Subscription rates, $1.00 *per year. Reprints furnished at cost price.*

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All bills not relating to the Journal, and MEMBERSHIP DUES ($2.00 *per year), should be sent to the Treasurer of the Association, DR. JAMES B. FIELD,* 329 *WESTFORD ST., LOWELL, MASS.*

EDITORIAL.

With this issue the American Journal of Public Hygiene enters upon its fourth year. It is just three years ago that Dr. H. W. Hill undertook the Managing Editorship of the Journal of the Mass. Association of Boards of Health, expanded the Journal to a national standard, and secured the services of well known sanitarians to take charge of the several departments of professional hygiene. Under this broad policy the Journal has had a steady, healthy growth, and we now have as subscribers Boards of Health and hygienists in many of the states, in Canada and in Mexico.

In September of this year Dr. Hill resigned the Managing Editorship owing to the great distance intervening between his present location and the home office of the Journal. The committee on Publication of the Association accepted his resignation with regret.

The Committee, in reorganizing the Journal staff, have appointed Mr. Rickards Managing Editor, and have urged Dr. Hill to accept the position of Associate Editor.

The new Managing Editor will, therefore, have the services of one experienced in Journal affairs and the ever ready support of the Editor-in-Chief, Dr. S. H. Durgin, without which the present successful career of the Journal would have been impossible.

It will be the policy of the new Managing Editor to continue along the present lines, building up and enlarging the scope of the Journal as fast as its growth permits. The rate at which it grows will depend largely upon the support given by the public hygienists of the country.

OCTOBER QUARTERLY MEETING
OF THE
Massachusetts Association of Boards of Health.

The quarterly meeting of the Massachusetts Association of Boards of Health was held at the Brunswick Hotel, Boylston street, Boston, on Thursday, October 25, 1906. Luncheon was served at 1 P. M., and afterwards a business meeting was held under the presidency of Dr. H. P. Walcott.

On motion of Dr. Durgin the reading of the records of the July meeting was dispensed with.

Upon the recommendation of the Executive Committee the following gentlemen were elected members of the Association:

Fred A Bates, Lowell.
Thomas J. Beane, Lowell.
C. S. Millet, M. D., Brockton.
W. W Fullerton, M. D., Brockton.
Michael Duffley, Brookline.

The PRESIDENT: Is there any other business to come before the Association at this time? If not, the reading of the regular papers upon your programme will now be in order.

First is a paper upon "Gaseous Disinfectants," by Dr. H. W. Hill. The paper will be read by Mr. Coffey, in Dr. Hill's absence.

Mr. Coffey read Dr. Hill's paper, as follows:—

TERMINAL DISINFECTION—REASONS AND METHODS.

By H. W. Hill, M. D.
Minnesota State Board of Health Laboratory,

Disinfection is one of the weapons chiefly in use by the professional public hygienist at the present time in his warfare against infectious diseases. The principles on which it is based are logical; they have a strong grasp on the public mind; they provide reasons for doing something obvious, definite and impressive. It is well worth while, therefore, to review these principles, to consider the methods by which may be accomplished disinfection in fact as well as in name; to list the diseases in which disinfection is usually practised, and finally to ask and answer if possible the question whether disinfection, logical and efficient, though it be, really restricts disease.

To begin with definitions. Disinfection is literally the destruction of the power to infect. In its widest sense, the term can be properly applied to any procedure whatever by which the infectiveness of anything possessing infectiveness is removed. Hence the boiling of instruments before surgical operations, the use of bactericides in infected wounds, the exposure of infected materials to sunlight, the efficient embalming of the infectious dead, the prophylactic treatment of infectious excreta, the steaming of infected clothing, even the pasteurization of infected milk, the filtration of infected water, the destruction of yellow fever or malaria-bearing mosquitoes can be properly called disinfection. In actual use, however, in public health circles the term has come to mean specifically the destruction of the infectiveness of the environment of infected persons. Hence in public health practice it relates to infected things and not to infected persons. Moreover, public health disinfection in practice is usually restricted still further to terminal disinfection, i. e., to the disinfection of the patient's room or house and its contents, after their vacation by the patient. The disinfection of excreta, clothing, eating utensils, etc., which is required daily during the course of the disease is usually left to the medical attendants, although these are as important, in many cases much more important, than terminal disinfection, and it is as much the duty of the public hygienist to devise by experiment and to recommend officially to physicians the best methods for these forms of disinfection as it is to do the same for terminal disinfection. I shall, however, confine myself to the question of room disinfection.

Disinfection disinfects by destroying the power to infect—

and this is usually accomplished by destroying these minute living organisms which are known to cause infectious diseases —or at least certain of the infectious diseases, and by inference and analogy, all of them. Disinfection differs, therefore, from sterilization, since sterilization means the destruction of all the minute living organisms, while disinfection means only the destruction of those minute living organisms capable of producing disease. Anything sterilized is, therefore, also disinfected, for if everything be killed, the harmful organisms die with the harmless ones. But things may be disinfected without being sterilized, if the harmful organisms are killed, while the harmless ones are left surviving. This distinction is worth making because methods of disinfection quite adequate for the destruction of harmful organisms, may at times fail to destroy more resistant but harmless organisms, the subsequent growth of which latter may mislead the observer, and induce him to believe that the disinfection was imperfect.

If then we agree that disinfection from the public hygienists point of view narrows itself down to the destruction of disease-producing organisms after their escape from the body, it is advisable to consider how they escape from the body, where they escape to, how long they live in their new location, what the chances are of their removal from those locations to well persons, while still capable of producing disease, and finally, if we can, to determine how often such transfer does actually occur. No amount of argument or experiment demonstrating the *possibility* of such transfer should distract the public hygienist from the sober and reasonable consideration of facts relating to the *probability* of its occurrence—still less from facts which tend to actually demonstrate whether or not the possibility or probability thus determined is actually realized in every day practice. Chapin of Providence has in recent years considered very forcibly this subject and his papers have done a great deal to pave the way for a dispassionate and logical consideration of the great question, "It is all right theoretically, but *does it work?*"

In principle, any disease believed to be due to a specific organism, where the latter may escape from the body, survive for a time in the place to which it escapes, and be transferred from that place to a well person, should be disinfected for by the application to all possible lurking places of efficient methods for its destruction. The following is a fairly complete list of the diseases in this country which should be disinfected for, if those principles are to be logically carried out—typhoid fever, diphtheria, grippe, dysentery, erysipelas, glanders, rabies, actinomycosis, tuberculosis, leprosy, syphilis, soft chancre, gonorrhea, gonorrheal ophthalmia, cerebro-spinal meningitis, tonsillitis, pneumonia, cholera, anthrax, plague, smallpox, measles, scarlet fever, whooping cough, tetanus, possibly acute rheumatism and cancer. Besides these specific diseases, there are a large variety of general infections, grouped roughly under the name of septicaemias, due to organisms capable of escape from the body and of survival after escape.

The points of exit from the body of the infective organisms differs somewhat in each case from a quantitative standpoint, but in general, the naso-pharynx and anus are the chief, the skin and the urine being involved, in some diseases always, in others at times. Those affections particularly affecting the internal mucous surfaces such as diphtheria, typhoid fever, etc., are chiefly infections through the corresponding excreta. It is a question whether or not measles and scarlet fever are infective from the skin, while little doubt of their infectiveness from the naso-pharynx can now be entertained. Leprosy is probably chiefly disseminated from the nose of the patient.

In face of this long list of infectious diseases, which might properly be disinfected for, it is interesting to note that American practice usually includes routine municipal disinfection for only four diseases—smallpox, diphtheria, scarlet fever, and of late years, tuberculosis. It is true that the long list given may be cut down by eliminating rare diseases, usually disinfected for when recognized; diseases not readily transmitted except through lesions of the skin, such as tetanus, rabies, actinomycosis, and diseases known to be comparatively rarely transmitted otherwise than by direct contact, such as the venereal diseases. But even so, many diseases remain, for which terminal disinfection is not done, notwithstanding the general belief that they may be transmitted indirectly. The only reason why measles, whooping cough, grippe, dysentery, tonsillitis, etc., are not disinfected for is because of the usual belief in their mildness or because it is obvious that other methods of infection than through things far outweigh fomital infection. Work done and observations made, particularly by Chapin, tend to show that diphtheria and scarlet fever may soon be added to the list of those diseases whose transmission is so much more frequently direct than indirect, that disinfection to prevent the latter is scarcely a factor in reducing their prevalence.

Concentrating attention on the four diseases by common consent chiefly subjected to disinfection, we find that the infective agents in all four, smallpox, tuberculosis, diphtheria and scarlet fever, escape chiefly from the naso-pharynx. The skin in smallpox is undoubtedly infective; and it has been usually believed that the same is true of scarlet fever, although considerable doubt is now expressed on this subject. At all events, in all four diseases the infective agents escape chiefly, if not wholly, from the nose and mouth. They escape accompanied usually by the mouth and nose discharges. These discharges escape by voluntary spitting or blowing of the nose, by sneezing, coughing, laughing, and loud talking, etc., and by drooling. They are deposited chiefly in the immediate neighborhood of the patient, hence in handkerchiefs, the pillow and sheets, etc., the bed frame, floor near the bed, and to some extent especially the minute particles thrown out in sneezing, coughing, etc., almost anywhere in the room; also, since the hands go constantly, consciously or unconsciously, to the nose and mouth, things touched by the patients hands.

Being accompanied always by particles of saliva, if not by large masses of sputum or nose discharge, these organisms remain wet for considerable periods wherever they happen to fall, the time during which moisture is retained depending on the humidity of the atmosphere, the nature of the surface on which they are deposited, etc., etc. While drying to the point of solidity usually occurs, drying to the point of pulverulency can seldom occur, and the bug-bear of "atmospheres of sickrooms laden with dust carrying the germs of disease" is not frequently realized. Indeed, when drying has been prolonged enough for particles of this nature to become broken up sufficiently finely to admit of being blown about and inhaled, the organisms contained in them will usually be dead. On the other hand, attrition by passing feet, brushing, etc., may dislodge them when still moist, but if so, they will be in relatively large and heavy fragments, falling quickly to the floor and unlikely to reach the one great portal of entry to a new victim—the naso-pharynx. Hence the chief danger to be feared from such patients, apart from direct transfer of sputum, etc., as the hands to the mouth, is the transfer of the minute particles coughed or sneezed out, which float for a time in the air, and may be inhaled while both fresh and moist. Sputum is not abundant as a rule, except in the case of tuberculosis and the results of drooling at the mouth are likely to be confined to the immediate clothing, etc., of the patient. Moreover even coughing, sneezing, etc., are much more common in tuberculosis than in diphtheria, scarlet fever or smallpox. Hence it is, that from purely *a priori* reasoning it would be proper to infer that, apart from the bed, bedding, clothing, handkerchiefs, etc., of the patient, the infective agents of these diseases other than tuberculosis will not be scattered widely or abundantly—and actual experiments by myself confirm these results at least for tuberculosis and diphtheria. Again it would be proper to infer that the chief scattering would occur in tuberculosis, and this again has been found true comparing the same two diseases. Finally it would be reasonable to suppose that the organisms thus scattered would die rather quickly from simple drying; and in diffuse daylight (the conditions usually obtaining in the rooms of most patients) neither tubercle bacilli nor diphtheria bacilli could be counted on to survive three weeks, in my own experiments. In general then, when the disinfector enters a room just vacated by a patient suffering from diphtheria or tuberculosis (and by inference the same is true of smallpox and scarlet fever), the air of the room may contain a few organisms floating about, having just escaped from the naso-pharynx of the patient in the last few coughs, sneezes, etc., of the patient before leaving. Smears of sputum in all stages of dryness may be encountered upon the pillows, etc., and dry smears upon the furniture, etc., near the bed, placed there by the patient's hands. But the greater part of the infection of the room is concentrated about the bed, and in the rest of the room it is quantitatively small and qualitatively weak, particularly in diphtheria. In tuberculosis, for reasons given below, this factor is more serious than in diphtheria. Terminal disinfection is usually done after recovery in diphtheria, scarlet fever and smallpox, since recovery is the majority rule in these diseases. The great majority of the bacteria, etc., thrown out by the patient certainly in diphtheria, probably in scarlet fever and smallpox are thrown out chiefly in the acute stages of the disease, which is long past before terminal disinfection is done. Most of these organisms have died a natural death by the time the case is released from quarantine. Of course the patient has doubtless continued to throw off organisms during convalescence but fewer and fewer as the days go by. In the case of tuberculosis however terminal disinfection is done much more frequently after death or removal, and thus during the height of the disease than in smallpox, scarlet fever or diphtheria. Hence in cases of tuberculosis, the infection is usually quantitatively greater up to the time of disinfection than in the other cases, absolutely and relatively.

On these grounds it seems to me that whatever reasons may be offered for the disinfection of smallpox, scarlet fever and diphtheria, apply much more forcibly to tuberculosis, and that those who regard as strong the arguments against terminal disinfection after the first three diseases must admit that tuberculosis offers *in esse* a very different proposition. Personally I believe that disinfection after tuberculosis should always be done, if the room of the patient is to be occupied by a well person within three weeks, and I would prefer to have the limit three months.

Admitting, then, that terminal disinfection of rooms is a proper weapon of the public hygienist at least against tubercular infection, it remains to discuss the methods to be adopted. Disinfection may be accomplished by applying to the infected surfaces any agent which will kill the bacteria. While sunlight, steam or dry heat of sufficient intensity, will kill bacteria, these can seldom be successfully applied to all parts of the interior of a room. Washing with disinfectant solutions is a laborious task, and so long as we assume that any surface or crack or irregularity of the floor, wall, or furniture may carry the infective agent, washing cannot well be trusted, for the washer may wash everything except the fatal point. Disinfectant gases have the advantage that they do not weary in well-doing or object to getting in behind heavy furniture. They have no regular hours of work and do not overlook cracks or crevices anywhere. Primarily gases are used because of the universality and uniformity of their action and because they apply themselves to all parts of the room and to all irregularities of mouldings, etc.

Many gases are highly efficient when properly used. Sulphur dioxide long held the first place, but chloride, hydrocyanic acid, even carbolic acid vapor are efficient. All act, however, immensely more effectively in humid than in dry atmospheres. Indeed, in absolutely dry atmospheres they are inert. Sulphur fumes and chloride are objectionable on account of their action on metals and fabrics, hydrocyanic acid is too deadly a poison for routine use and carbolic acid vapor is probably too expensive, when used in sufficient concentration. Formaldehyde has now been almost universally adopted on grounds of cheapness, innocuousness and efficiency, so that practically consideration of the other gases may be dispensed with.

Formaldehyde is a gas of peculiarly pungent and striking odor. Commercially it is to be had as a (nominally) 40 per cent solution by weight in water. It is worth noting that it was in this form that it was first introduced as a disinfectant and to the fact that it was at first thus invariably associated with water is due I think its initial success as a disinfectant. Had formaldehyde been introduced otherwise than as a watery solution, the evaporation of which was essential to the liberation of the gas, humidity would not have been secured, and formaldehyde would have been ranked as no more efficient than sulphur or chlorine. After its reputation was established by experiment with the liquid form, solid forms were introduced, (the result of concentration of the solution, so that polymerization occurs). From these polymers, the gas may be liberated by heat, but since almost no water is evaporated with the gas, the polymers are relatively inefficient, unless water be added from an outside source. Since for equal quantities of available gas, the polymers are usually very much more costly than the liquid solutions, I see no advantage in their use for ordinary municipal purposes and will not describe the numerous mechanically ingenious devices for their use.

Successful room disinfection at the present time, then, requires the presence in the room of sufficient gas to fill the unoccupied spaces and in sufficient concentration to kill the organisms, together with the maintenance of these conditions for sufficient time to ensure the complete action of the gas. The liberation of the gas in the room has been accomplished by a large variety of devices. These may be classified as mechanical, thermal, chemical and thermo-chemical methods. The mechanical methods may be illustrated by the spraying of formaldehyde by air pressure; in Chicago, a small bottle and atomizing device, capable of discharging a very fine spray upon sheets, hung on lines across the room proved satisfactory to the local authorities for a long time. In Philadelphia a much larger device for direct spraying into the room through the partly opened door is in use; while I myself devised a large atomizing apparatus, in which the atomizing agent was steam instead of air, the steam furnishing the required high humidity as well as the projecting force. Thermal methods range from the simplest form of pan, from which the formaldehyde is boiled off by a direct flame, to complicated devices intended to bring the formalin to the boiling point in small successive quantities, thus avoiding the polymerizing which results when large quantities are treated for considerable periods. Autoclaves in which the formalin solution was heated in a tight receptacle until pressure of one or more atmospheres was secured had a great vogue at one time. In general however most of these devices have failed of general adoption because of high initial cost, awkward size or shapes, complication of design or inefficiency.

The chief chemical methods are two in number. One, the unslaked lime method, depends in principle on the fact that since formalin is a solution of the gas in water, removal of the water will set the gas free. Unslaked lime was used to take up the water, but it was soon found that the chemical reaction involved the destrution of the formaldehyde. Later the addition of alum was found to prevent the destruction of the formaldehyde, and the method then proved an excellent one for the liberation of the gas. Unfortunately, the very fact that the gas is liberated by the chemical abstraction of the water involves the non-liberation of the water in the room—hence the humidity so valuable in disinfection by any gas was not secured. Very favorable reports accompanied the early recommendations of this method but my tests failed to secure similar results. On investigation I found that the favorable experiments were based on the use of test bacteria, dried so long before use that they refused to grow, even without exposure to the gas. The second chemical method consists in mixing permanganate of potash with formalin. The result is a violent chemical reaction, between the permanganate and part of the formaldehyde, such that heat is evolved so great as to evaporate the remaining formaldehyde and water more or less completely. A good deal of work has been done in the attempt to determine the relative proportions in which these two chemicals should be mixed in order to secure the maximum liberation of gas, with the minimum destruction of gas. If too much permanganate is used, a correspondingly large amount of formaldehyde is destroyed, leaving too little to be evaporated. If too small an amount of permanganate is used, the amount of heat generated is not sufficient to evaporate the whole of the remaining formalin. I have appended a note which indicates the various proportions recommended by various investigators. The problem is not quite so simple as might appear at first glance, because the relative proportions of the two ingredients required for maximum efficiency at minimum cost varies according to the method of mixing the reagents, the physical condition of the permanganate and the initial temperature of the container in which the reaction occurs. As to the cost of this method as compared with other methods of setting free formaldehyde, estimates vary, and must be worked out in each community for itself. A community which already possesses a regular disinfecting staff and equipment will not greatly benefit by adopting this method because the initial cost of other apparatus, etc., has already been paid, and because the proposition to reduce the staff on the plea of the less time and labor involved on the new method would not usually be entertained. Moreover since much formaldehyde is used up and some wasted in the chemical reaction, it is in general necessary to provide about twice the amount of formaldehyde for the permanganate method that would be needed if the formaldehyde were driven off by other means, such as boiling over a flame. It will easily be seen, then, that the health department which wishes the principle of maximum possible efficiency at minimum necessary cost to rule in its business affairs must do a great deal of careful figuring on prices of labor and time expended as well as apparatus and materials used before deciding this question. I may say that in my own opinion the whole problem of conducting municipal disinfection no longer hinges on whether the infective organisms can or cannot be killed by a given method. The infective agents can be killed by any one of fifty or more methods, there is no longer any dispute on that point. The problem now is not merely to achieve the killing, but to secure the killing at the minimum of cost, and the items to be considered are not by any means alone those of apparatus or materials, but also time, labor and accessories such as horses, wagons, drivers, disinfectors, helpers, etc., etc. These necessarily vary in each community, according to local rates of wages, etc., and according to the amount of work to be performed.

I suppose that the question which most prominently is present in your minds at this moment is—how much formalin should be used per 1000 cubic feet? This is the most difficult of questions at the present. It would seem to be a simple matter to determine the facts experimentally. Chicago long claimed the best of results from five ounces per thousand feet, while Pittsburg admitted occasional failures from 73 ounces per 1000 feet. The experiments of the state of Maine on the permanganate method showed an extremely high rate of efficiency with 32 ounces per 1000 cubic feet, while in my own experiments, confined, it is true, to the diphtheria and tubercle bacilli, 1 ounce per 1000 cubic feet showed perfect results. The unslaked lime method already described was recommended as highly efficient at 6 ounces ped 1000 cubic feet, while I failed to kill at all uniformly with 10 ounces per 1000 cubic feet. The fact is that no fixed amount can be stated without qualification, except an amount of solution so large that its evaporation involves the evaporation also of sufficient water to raise the humidity to a high point. I think that this was the secret of the success of the Maine experiments—and that the use of the permanganate to which their success has been inferentially attributed was a mere incident. I am confident that equally good results could have been secured by a similar evaporation by other means of a much smaller quantity of formalin, combined with sufficient water to make the same total of 32 ounces.

The basic factors of successful disinfection and by that I mean maximum efficiency with minimum expenditure are: First, sufficient gas; second, action of this gas for a sufficient time. The accessory factors all relate to securing these two. The accessory factors are rapidity of evolution, (in correlation with the leakiness of the room and the amount of absorbing surface exposed), the amount of humidity present and finally the kind and condition as regards dryness of the organisms which are to be killed. The condition of the exposed organisms as regards dryness is most important. A fresh organism (i. e. taken from a recent active culture) if moist, is readily killed even by a dry gas (i. e. in the absence of atmospheric humidity) because the moisture necessary to the action of the gas is supplied by the moisture of the organism. A fresh organism, rapidly dried, is insusceptible to the action of a dry gas, but readily succumbs to a moist gas (i. e. gas liberated in an atmosphere of high humidity). But an organism dried for a considerable time (varying with the organism, say a week or ten days for the diphtheria bacillus) is so weakened by the drying, that even if not killed by that alone, it succumbs readily to the action of relatively small quantities of gas at relatively low humidities.

In my own experiments, I have been able to adjust the factors of humidity of and of dryness of organism so that in any given experiment, I could secure any result which I pleased, irrespective, within limits, of the amount of gas used, so that if beforehand ten ounces of formalin were prescribed, I could arrange matters so that all the organisms were killed, half of them killed or all left surviving, just as I pleased, using the same cultures in all cases. Similarly if one ounce per 1000 feet be prescribed, I would undertake to kill or to leave surviving at will the organisms exposed, provided that I am allowed to control the other factors of leakage, rapidity of evolution, humidity and condition as to dryness of the exposed organisms. Even in an air tight room, thus cutting out the leak factor, I would undertake to secure similar results, under the same conditions. I know this is so because I have repeatedly done just this.

Now it is little wonder that in so-called "practical experiments" where four of the six important factors, leakage (and absorption), humidity, rapidity of evolution and dryness of organism do not receive proper attention, (i. e., "experiments" in actual rooms occupied by patients) investigators have reported the most contradictory and perplexing results. It would be amusing if it were not alternately exasperating and pathetic to see results quoted from a given experiment as due to the use of a certain machine, a certain method, or a certain preparation of formaldehyde, instead of to the particular combination of the above stated factors which happened to obtain at the time. A given quantity of formaldehyde gas in a given space does not depend for its activity on how it reached that space—or whether it came from this or that machine or by this or that method. The real accessory factors of the results achieved are the length of time it is allowed to act in this concentration, the humidity, and the work which it is called upon to do.

It is necessary then to determine the average conditions concerning these factors which obtain in practice. In actual practice, the condition regarding dryness of the infective agents may be argued out as follows—at least for diphtheria and tuberculosis. Those organisms thrown out by the patient up to three weeks previous to the disinfection may be counted on as mostly dead. Those thrown out within two or three days preceding disinfection may be counted on as fresh and active, and more or less moist. Those thrown out between these two periods are probably alive, and dry, but their vitality has been more or less impaired, increasingly so with the amount of time elapsed. Now the fresh moist organisms thrown out recently are very readily killed by formaldehyde gas; those over a week or ten days old are so decrepit merely from drying that they readily succumb. Hence only those thrown out for say the week preceding disinfection need give any difficulty. These are dry and therefore so far resistant, while they have not yet been weakened by the dryness. Hence it is on these organisms that the attention of the investigator should be concentrated. Whatever will kill them will kill the others.

Hence it is that the humidity factor must be looked out for in practical disinfection—because the organisms which are most to be feared are in this condition of dryness, not indeed to the point of pulverulence, but to the point of resistance to gas. Concentration of the gas is to be provided for first by stopping all leaks in the room, and second by securing rapid evolution. It is easily seen that these are correlative. Slow evolution does no harm if there be no leaks (or absorption), because the proper concentration will be achieved in time. But with slow evolution and a leakage (or absorption) equivalent in rapidity to the rule of evolution, the desired concentration could never be obtained. Now leakage, and absorption, can never be wholly excluded in practice and therefore rapid evolution is always essential. In this connection I am glad to refer to the ingenious method of Dr. Wallace Clark, H. O., Utica, N. Y., who allows formalin to flow from a douche bag upon the hot fire pot of the ordinary hot air furnace, the gas being transmitted to the rooms through the heating pipes. Although of obviously limited applicability it permits, when available, the rapid evolution and high humidity essential to success in practice.

As to the final factor of length of time of action, this again depends on the amount used, and the humidity secured. In general I believe that twenty ounces of formalin per one thousand feet, rapidly evolved, can be counted on to produce complete disinfection in the ordinary diseases disinfected for on one thousand cubic feet of space, within two hours; that ten ounces of formalin with ten ounces of water will accomplish exactly the same results and that five ounces of formalin with fifteen ounces of water will do just as well, always provided that leakage is well controlled. In thus recommending five ounces of formalin and fifteen ounces of water, I am allowing as a margin of safety five times the amount of formalin that I have found efficient in laboratory experiments. In the rare cases where anthrax spores or other exceptionally resistant organisms might require disinfection, it would be no harm to double these quantities, and the time of exposure, although I cannot speak with experimental accuracy on this point.

As to methods of evolution, so long as they are safe and rapid they will succeed, and economy is the only remaining point to consider. Where the wetting of the room and its contents with a finely atomized spray is not objectionable, a spraying device offers the quickest and best means. The steam atomizer which I devised had advantages of this kind, offset however by the size, weight and, for unskilled labor, relative danger of the apparatus, which carried a head of fifty pounds of steam. Any device resembling an exaggerated kettle, the spout of which can be applied through the keyhole, or the hole left after removing the handle of the door, or even through the partially opened door, the opening being appropriately draped with a wet sheet to avoid escape of gas will secure excellent results, always provided that the flame used is sufficiently powerful to rapidly evaporate to dryness the whole contents of the kettle. Open receptacles to be heated by a flame and to be left in the room are objectionable only because of the danger of fire and the difficulty of so adjusting the lamp that it will evaporate the contents of the receptacle completely, and yet not injure the receptacle or the room by continuing to heat it after the evaporation is complete.

The chemical methods outlined above are excellent, so far as evolving the gases are concerned, but the unslaked lime method reduces the humidity otherwise available from the formalin itself and the permanganate method requires an excessive amount of formalin to allow for that destroyed in the reaction. In both methods economy of formalin demands accessory apparatus for securing humidity.

If I may add a paragraph or two regarding the disinfection of public conveyances, sleeping cars, street cars, etc., I would like to say that it seems to me that the disinfection of these rests on a somewhat different basis from the disinfection of ordinary rooms vacated by infectious patients. The public conveyance is offered to the public as a conveyance, and not as a room recently occupied by infective persons. If occupied by patients who are infective, they are likely to be reoccupied immediately afterwards, when the organisms thrown out by the patient are still fresh and moist; they are occupied by all sorts and conditions of persons, unsuspicious of the recent infection—and finally and chiefly the seats, etc., which the infected patient occupies are more nearly analogous, so far as the likelihood of infection is concerned, to the pillow and bedding of the ordinary patient's room, than to the furniture, chairs and tables of the latter, to which they are more likely to be compared. There is no question in the minds of any opponent of municipal house disinfection that pillows and bedding should receive disinfection before subsequent use, and I think that the occupation of an undisinfected plush-lined seat in a railroad car immediately after its vacation by an infected patient is somewhat like getting into a diphtheria patient's bed, without disinfecting the sheets. As to the disinfection of sleeping berths and contents after such occupancy, there can be no question.

In summarizing this paper I would like to emphasize the following points:

1. The basic factors of successful disinfection are sufficient gas, acting for a sufficient time.

2. To secure these, the stoppage of all leaks and rapid evolution of gas will alone secure the proper concentration of gas; while humidity is essential to economy of gas, and to economy of time.

3. What constitutes sufficient gas, sufficient time of exposure and sufficient humidity, cannot be stated as fixed for any one factor unless the other factors be taken into account also. They are all correlatives of each other and depend finally on what results it is desired to achieve.

4. With the ordinary pathogenic organisms ordinarily disinfected for and rapid evolution, twenty ounces of formaldehyde will meet all ordinary conditions, while ten ounces of formaldehyde with ten ounces of water or five ounces of formaldehyde with fifteen ounces of water will act just as well, because all three prescriptions supply enough gas and enough humidity.

5. For the permanganate method, twenty ounces of formalin should be used in order to secure both gas and humidity in sufficient quantities. I am not aware that a method for using permanganate in which less formaldehyde and more water can be evaporated by the chemical reaction alone has been devised. If this is done, however, the amount of formaldehyde may be reduced, the total of twenty ounces being maintained.

6. Gas evolved from solid forms of formaldehyde or otherwise obtained in a dry form is just as good as, but more costly, usually, than gas evolved from moist sources, if the necessary humidity be provided also by an accessory operation.

7. We already admit practically by inaction the futility of disinfecting for the great majority of the acute infectious diseases. Smallpox, scarlet fever and diphtheria are probably to be included with these. But, for reasons given, chronic infections with a high mortality, such as pulmonary

tuberculosis, leprosy, etc., or where particularly active organisms with unusually high resistance, like anthrax, are concerned, should continue to be disinfected for.

8. The disinfection of public conveyances especially those having seats, hangings, etc., paralleling the conditions of a patient's bed, should be disinfected after each known use by an infected occupant.

References:

Evans and Russell (Maine State Board of Health, 1904) recommend 32 ounces of formaldehyde and 10 ounces of potassium permanganate, claiming that 80 per cent of the formaldehyde present was liberated.

Hill (Boston Board of Health Laboratory) working on the same problem two years earlier, concluded that the results were extremely irregular, but that a much smaller amount of formaldehyde than 80 per cent. was liberated, the exact amount varying very much.

Salmon (American Medical Journal, April 15, 1905) repeated the work of Evans and Russell, finding that 26 per cent. only of formaldehyde was liberated, 33 per cent. destroyed in the reaction and 41 per cent. left unevaporated. Salmon advised mixing in the proportion of 6 parts of formalin to 5 parts of permanganate, finding that in this proportion 51 per cent. was given off, 39 per cent. destroyed, 10 per cent. left unevaporated.

Frankforter & West (Journal American Chemical Society, Sept. 1906) find that the fineness of division of the permanganate and the rate and manner of addition of the formalin greatly affect the result. They advise mixing the permanganate with sand (equal parts) and using this mixture in the portion of 2 to 1 part of formalin. Allowing 30 minutes for the addition of the formalin, they secured from 70 to 80 per cent. of formaldehyde liberated, but if such a slow method of adding formalin were adopted, the rapid evotion and simplicity of apparatus would be done away with.

Base (Journal Am. Chem. Soc., Aug. 1906) gives a number of experiments with permanganate and formalin, but it would seem from Frankforter's experiments that Base limited himself to mixtures in proportions not the best available for the purpose in view.

The Illinois State Board of Health issued a circular recently (1906) on "Practical Disinfection," in which 16 ounces of formalin and 6 3-4 ounces of permanganate are recommended (in a 10 or 12 quart pail) for use at temperatures above 60° F. It seems obvious that the whole subject needs careful re-examination with attention to all the varying factors outlined above before "Maximum result from minimum expenditure" can be attained.

Additional References.

Chapin—Annual Reports of Providence Board of Health, 1900-1905. Journal Am. Med. Assn., Aug. 25, 1906.

Hill—Trans. American Public Health Assn. 1902, p. 209.

Hill & Rickards, Trans. Am. Public Health Assn. 1902, p. 509..

THE PRESIDENT: The papers of this afternoon are so related in their scope that it has been decided that we had better postpone the discussion till after the reading of Dr. Chapin's paper. We will, therefore, now call for the reading by Director Rickards of the Boston Board of Health Laboratory of his paper upon the "Value of Two"—not three, as written in your programme—of "Two Consecutive Negative Cultures in Releasing Diphtheria Patients." Mr. Rickards:

THE VALUE OF TWO CONSECUTIVE NEGATIVE CULTURES AS A METHOD OF RELEASING DIPHTHERIA PATIENTS.

By B. R. Rickards, S. B.,
Director Boston Board of Health Laboratory.

Mr. President and Members of the Association:—

You have listened many times to papers on Diphtheria and the problems which this disease presents to those connected with public health work. In fact, this Association has listened on two separate occasions to papers with somewhat similar titles. The first by Dr. Ernst was read in 1897, about a year before the regulation requiring two consecutive negatives went into effect,—the second by Dr. Hill, was given after the regulation had been in force a number of months.

In the eight years which have passed since that time we have had a chance to study the practical workings of the regulation in detail. It is my purpose to present to you some of the original reasons for the adoption of this regulation, to give some statistics which are now available bearing upon it and to compare it to some extent with other methods of release.

Three methods are in common use to-day for releasing from isolation patients convalescing from diphtheria. The first of these may be called the time limit method, where patients clinically well are released a certain number of days after the membrane disappears from the throat. This method was, before the advent of modern bacteriological methods, in more common use than it is to-day. After diagnostic bacteriological laboratories began to be established a single negative culture was usually demanded before setting the patient at liberty and this method is to-day probably more common than either of the other two. The third method, that of requiring two consecutive negative cultures, was the outgrowth of the single negative method.

The time limit method being a purely arbitrary one has the disadvantage of releasing some patients while they are still capable of carrying infection and of holding others after nose and throat are clear of the diphtheria bacillus.

Were bacteriological methods perfect a single negative culture would be a sufficient safeguard in releasing diphtheria patients from isolation. Unfortunately, the working error in taking release cultures is comparatively large. While a positive culture is under ordinary circumstances convincing evidence that the patient is infected with *Bacillus diphtheriae,* a negative result has no such conclusive meaning. In laryngeal cases for instance there is difficulty in reaching the infected area. Moreover, the swabs once infected may not yield positive results owing to some flaw in the technique or, more likely, to overgrowths by some rapidly developing organism. Dr. McCollom of the South Department of the Boston City Hospital has convincingly shown that even in well marked cases a negative may be obtained unless care is used in taking the culture. If this be true of cultures for diagnosis how much more is it true that a single negative culture for release may not show the true facts of the case. Here there are no pathological conditions to guide one to the infected places, in fact in some cases the throat may be temporarily free from the diphtheria organism, the latter having retreated into the crypts of the tonsils. Again, if the case appears clinically well there is hardly the same incentive to thoroughness as there was, say, at the time of taking the diagnosis culture.

If then, the bacteriological error on a single negative is so large, why change from the arbitrary standard, or why not accept the certification of the physician that the patient is well? Simply because the bacteriological error is less than the clinical error, since in perhaps a majority of cases the patient is clinically well long before the organisms have disappeared from the throat.

In order to show the facts regarding the single negative for release I desire to present the following figures:—In 1898 out of 1002 persons released by the laboratory 201 or 31 per cent secured a negative culture which was afterwards followed by a positive. In the first six months of 1900 this number was 154 out of 455 or 34 per cent,—while during the first eight months of the fiscal year, 1906 (February to October) 76 out of 497 or 15 per cent would have obtained a premature negative. In other words it may be safely said that of those persons who are released by the laboratory that from 15 to 34 per cent would have been released while still capable of infecting others if release were given on a single negative. I use the phrase "while still capable of infecting others" advisedly. Virulence tests made on diphtheria bacilli isolated from patients' throats shortly before the throats finally cleared, have in the majority of cases proved positive. This fact has been proved by many workers. Figures on this point also show a remarkable agreement. Wilson in Brooklyn previous to 1898, testing every case for virulence that ran over four weeks found 77 per cent of organisms isolated virulent. The Mass. State Board of Health a little later found 75 per cent of cases tested, virulent, and of the cases tested in the Boston Board of Health Laboratory during the last eight months 9 out of 12 cases, or 75 per cent, were virulent. Of the remaining three negative cases one was on an organism isolated from the ear, the second from the nose and the third was from a bacteriological case. With the exception of a few cases of long duration and in so-called bacteriological cases where the clinical signs of the disease are few or missing, the virulence of the diphtheria bacilli seems to persist up to the time of their disappearance.

Unfortunately definite figures are not available to show what percentage of cases in private practice are released prematurely on two consecutive negatives. Undoubtedly the number is very small, probably considerably less than three per cent. A number of years ago three consecutive negative cultures were required by Dr. McCollom before a patient could be released from a diphtheria ward of the Boston City Hospital. So extremely rare, however, did he find a positive result following two consecutive negatives that after a fair trial the third negative was dropped.

In Boston it is required that for release a culture must be taken from both nose and throat and that after the first negative is obtained by the attending physician the next culture shall be taken by a medical agent of the Board of Health, the two cultures not to be taken on the same day. Each of these points is of undoubted value. We often find the nose infected with virulent bacilli for a considerable time after the throat is free from the organisms. Organisms from the nose may of course reinfect the throat or infect others. The throat and nose may both be apparently free one day and yet be found to be infected the next. But by far the most important clause in the requirement however is that referring to the medical agent. The cause of this is not far to seek. The family is naturally anxious to have the patient released from isolation, the attending physician is also naturally anxious to have the case clear up rapidly after the clinical signs have disappeared, in fact often finds it exceedingly difficult to explain to the family how after the disease of diphtheria has disappeared, the patient can possibly be a source of danger to others. Both patient and physician may consider the requirement a piece of red tape, and it is perhaps not strange if, after a long, tiresome case, his culture taking is not as thorough as it might be. The medical agent with his finer technique, perfected by constant practice and with no personal interest in the case sieves out those positive cases which have passed the screen of the attending physician. Such cases are then referred back to the latter until a negative is once more obtained, after which the medical agent again makes his test.

During the first six months of 1900, a year when diphtheria was very prevalent in Boston and elsewhere, of those cases released by the laboratory the average duration from the earliest symptoms as noted by the physician to the second negative culture for release was 23.3 days. During 1905, a year when diphtheria was comparatively light the average duration from the first positive culture for diagnosis to the second negative for release was 14.2 days. Allowing 2.6 days, the average time as found in 1900, as the average time elapsing between the earliest symptoms and the first positive we have an average duration of 15.8 days in 1905 as compared with 23.3 days in 1900, an average shortening of period of isolation by 6.5 days or practically one week. Considering these figures it seems fair to assume that if ten days to two weeks after the disappearance of the membrane be taken as the arbitrary standard for releasing patients, one would in the majority of cases be holding the patient longer than was necessary, since the average length of a case, in this city at least, is now but two weeks..

In connection with the shortening of the average duration of cases, one's mind naturally reverts to the fact that in the last few years antitoxin has been furnished free to all cases wishing it with the triple result that its use has greatly increased, that large doses are more often employed and that it has been more frequently given at an early stage of the disease.

In conclusion, it seems to the speaker, that the second negative method, while not perfect, is to-day the most satisfactory and scientific method of releasing diphtheria patients particularly when the second negative is taken by a medical agent of the Board, and where a virulence test is available for cases of long duration.

THE PRESIDENT: The last paper of the afternoon is Dr. Chapin's paper upon "Methods Employed in Providence for Releasing Diphtheria Patients." I have the pleasure of introducing Dr. Chapin.

THE METHOD OF RELEASE OF DIPHTHERIA PATIENTS IN PROVIDENCE.

By Charles V. Chapin, M. D.,
Supt. of Health, Providence, R. I.

Sanitary practice ought to be based on what we know of the origin of disease. According to the best evidence the contagious diseases extend not from known cases, but from those that are unrecognized, and from well persons infected with the disease, whom the English call "carrier cases." Infection usually does not take place except by quite direct contact. Fomites plays but little part in it. Unless these premises are accepted you will take little interest in the argument. It is only recently that the views expressed above have received any recognition. Until within a very few years we in Providence, as well as everybody else, believed that if we could only isolate every recognized case of contagious disease, until the patient appeared to be well, and disinfected the premises, we could stamp out the disease. In accordance with these views, in company with other Health Officials, I strove for years to increase the stringency of restrictive measures, but it became gradually clearer that even absolute control of reported cases of disease could accomplish only a moderate reduction in its prevalence. If this was so it seemed unreasonable to insist on such severity, and it appeared not unlikely that equally good results could be obtained by less drastic measures. The medical profession, and the public also, were seriously questioning the value of the measures usually adopted to control the contagious diseases, and were vigorously opposing the long continued isolation of well persons, even when it was demonstrated that they were the carriers of infection. It was considered unjust that the few well persons infected with diphtheria bacilli, and coming to the knowledge of the Health Officer should be isolated, while a much larger number of infected persons were certainly known to be mingling freely with the public. So firmly had I become convinced that our regulations were unnecessarily severe, and that as much practical good could be accomplished by dealing more leniently with reported cases, that in 1902 it was determined to modify our methods to bring them more in accord with our latest knowledge of the epidemiology of these diseases.

Previous to 1895, and before the use of cultures, it was customary to terminate isolation in diphtheria one week after the attending physician certified that the patient was well. In 1895 the rule was adopted of requiring one negative culture from the throat of the patient before the release. In 1896 one negative was required from the throat of every member of the family. This procedure met with great opposition; it also demonstrated that a very considerable proportion of the well members of the family were infected. We never required two negatives in Providence. Early in March in 1902 our present system was adopted. Since then we have taken down the warning sign ten days after the disappearance of the exudation, as certified by the attending physician, on a postal card sent to him for that purpose. But no children in the family may attend school until one month from the beginning of the case, unless two successive negative cultures from both throat and nose are obtained.

Almost all the children come to the health department for the purpose of having these cultures taken, and, of course, many of them are found infected. Of course the period of isolation has been reduced by the adoption of these rules. Formerly 57 per cent of our cases were isolated over three weeks, but now only 27 per cent of the cases are isolated beyond this period. The average period of isolation under these rules is 20.13 days.

Our plan is doubtless illogical. Infected persons are isolated for a while, and then allowed to mingle with the public, and even go to school, but that after all is what every health official permits. No one can possibly isolate even the sick until it is absolutely certain that they are no longer harboring diphtheria bacilli and no one even attempts to do this for infected well persons either in the family of the reported case, or elsewhere. Isolation is never absolute. The degree to which it is carried varies with the views of health officers and prosecuting attorneys. Even where the most stringent measures are carried out it is certain that many sources of infection remain uncontrolled, otherwise the disease would be eradicated. If absolute control is impossible, it is simply a question of judgment where the line shall be drawn. To make deductions from the comparison of statistics is difficult. It is impossible to show by such a comparative study that the amount of contagious disease in any community bears any relation to the stringency with which restrictive measures are carried out. The problem may be briefly stated thus: Since it is impossible to control absolutely every source of infection, how far is it wise to attempt to carry out our restrictions? I believe that both theory and experience justify the adoption of more lenient measures than are usually advised, therefore, we did make such changes in Providence.

It is only in the routine management of contagious diseases in cities that these moderate measures are advised. Incipient outbreaks in small communities, in public institutions, and even in day schools, may often be successfully controlled by an active interference which is not desirable under ordinary conditions. Thus where a child with diphtheria has been removed to the hospital, and treated there at considerable expense, largely for the sake of protecting the children in the family remaining at home, it is advisable to be quite sure that the patient is free from infection before discharge; therefore two, and even three negative cultures from throat and nose are recommended in such cases, and two cultures are required in Providence .

It will doubtless be asked, what was the result in Providence of the adoption of our present method? For some months after the adoption of the new rule for release to diphtheria patients there was a decrease in the number of cases reported. The same thing took place after disinfection was given up, and for nearly a week in September last, our hospital was empty, and the city was free from any reported case of the disease. While this is not a demonstration that we are right, it indicates that a little more leniency than is usually exercised is not necessarily fatal.

THE PRESIDENT: Gentlemen, the whole subject is now before you for discussion. Dr. Barnes, cannot we hear something from you in this matter?

DR. H. J. BARNES: Mr. President, only in relation to the relative humidity, which Dr. Hill lays so great stress upon. The question arose in my mind when listening to the paper what he meant by high and low relative humidity. We have an average relative humidity in our climate of about 70 per cent. Whether that he considers high or low I don't know. It fluctuates from saturation, 100 relative humidity, down to as low as 35, the lowest that I ever knew recorded in Boston. Once it was recorded as low as 12 per cent in Philadelphia. The mean relative humidity of Denver is 50 per cent, and it goes down to 10 per cent, and up to 100 per cent. So that in listening to the paper some doubt was left in my mind as to what he considers high and low relative humidity. To me a high relative humidity would mean 80 or 85 per cent moisture or above that, and a low relative humidity below 50 per cent.

If you were to fumigate in an atmosphere naturally constituted as it is in the summer time, without material elevation of inside temperature, you might have a relative humidity moist enough for the purposes of which he speaks. But in the winter time, owing to artificial heat, we depress the relative humidity very greatly inside a house. I made observations some years ago in Boston, and found that the mean relative humidity of our houses was about 30 per cent in winter and it went in one of the hospital wards as low as 12 per cent. That would mean an extremely dry atmosphere. Professor Ward of Cambridge subsequently made observations confirming mine, and Dr. Cowles, who made previous observations in the City Hospital, also reached the conclusion that the mean relative humidity in the winter time in our houses is about 30 per cent, that is, only 10 per cent higher than the kiln which is ordinarily employed for drying lumber, and 12 per cent which was once observed in one of our hospital wards by me was 8 per cent lower than the kiln. The application of this is in the fact that in the summer time we have a naturally constituted air as regards moisture, when it might not be necessary to increase the moisture in applying the formaldehyde, but in the winter time we should enormously increase the amount of moisture if we were to make the disinfection effective. The 10 ounces of water which Dr. Hill recommends, without stating what per cent the relative humidity should be, would lead us to very erroneous conclusions, for in the summer time this might be ample, and in the winter it would affect insufficiently the relative humidity of a thousand cubic feet of air.

How are we to know what the relative humidity is? Of course the only accurate way of measuring it is with the wet and dry bulb thermometers, but that involves a knowledge of the vapor pressure at the temperature when saturated and the vapor pressure at the dew point, and then a mathematical problem is involved. This is worked out in the tables which usually accompany the wet and dry bulb instrument used for measuring relative humidity.

I want to call your attention to a little German instrument called the hydrometer, which measures relative humidity in a more simple way and is substantially correct.. It may be two or three per cent out, but it is a very satisfactory instrument to use for the purpose of roughly determining what the relative humidity is at the time. That instrument consists of simply a dial, with figures running from zero to 100, indicating per cent, and on that dial is attached what is said to be the skin of an egg, susceptible of very great contraction and expansion due to dry or moist air. This acts on the pointer, moving it up or down on the dial, and you read at a glance within two or three per cent what the relative humidity is. So that with this instrument you would be able to determine whether you were getting moisture enough into the room to raise it to 85 per cent, or above, or whether you were having insufficient moisture for the purposes of fumigation.

In the winter when outside temperature is lower than in the house, condensation, in the form of frost or vapor on window-panes, always indicates a saturated atmosphere or 100 per cent.

DR. SWARTS: Mr. Chairman, I think these three papers bring up the same old contention that comes up before every association of health officers, the practical and the theoretical. It is the laboratory on the one side and the work of the health officer on the other. As a working bacteriologist and as an acting health officer I find myself keeping busy whitewashing both sides of the fence. Working in a laboratory I find the desirability of having three negative cultures from nose and throat, as the most desirable, the most practical and the most essential thing that could be called for, in fact, the only thing which should be satisfactory to any health officer. But upon the other hand, when requested to advise local health officers as to what they shall do in certain cases, I find myself on the other side of the fence, questioning the desirability of so much requirement. In other words, what is practical and what is safe should be the work and the aim of the working health officer.

From what we have heard from these papers, especially the first one, a most able paper, we are led to a state of confusion as to the necessity of obtaining the condition of things in these different ways. We must have certain apparatus and certain delicate instruments to know the condition of humidity. If any one of those six conditions mentioned is lacking we fail in the work that we are endeavoring to obtain. I think as working health officers what we ask for and what we desire to know is, if we take the chances which have been suggested by the last paper and no dire results do accrue, are we not satisfying ourselves, satisfying the demands of health requirements and health rules, and, what is more to the point, perhaps, in our position, satisfying the clients whom we serve, the public? For to work for the laboratory on the one side, and maintain its ideals, and to satisfy the public on the other hand, is an impossibility. If we follow out the requirements of the three negative cultures, or even a single negative culture, we find ourselves led to retaining cases in quarantine as long as three or four months, perhaps, which is first to our minds, possibly, absurd, to the public ridiculous, and brings all our actions into a state of disrepute with the public. But if we can tell them that ten days after the disappearance of the membrane in diphtheria, or in a certain period which has been shown to be practically safe as the result of the majority of the cultures taken, where negative cultures have been shown to occur in say 10 or 14 days in the majority of cases, and if in the practical results we find that the disease does not spread, I think we are safe in assuming that with less trouble and a shorter time of quarantine we are attaining the same results that we will get perhaps if we follow out the laboratory methods.

I am not decrying the practical application of the laboratory work, nor that it should be abandoned; in fact, we are keeping it up with our full vigor in Providence, in Rhode Island, and will continue to do so. But it seems to me we must have a little horse sense, a little practical application of what is fact and not what is theoretical.

PROF. WINSLOW: Mr. Chairman, I have listened with great pleasure to these papers, particularly perhaps to Dr. Hill's, because the clear and logical statement of the case and the incisive and epigrammatic sentences recall so pleasantly the personality of the writer, whom we so much miss here. It seems to me that the whole bearing of the work of the last ten years in this matter of disinfection and isolation is to change our ideas of the point of attack, to concentrate our attention on the place where the most good can be done. If, to use an old illustration, we compare the body to a walled city of medieval times, in which there are certain dangerous individuals, we will say marauders of some sort, it is obviously easier to stop those marauders at the gates of the city to hold them up there, than it is to catch them after they have got out in the surrounding forests. As Dr. Hill has so well pointed out room disinfection is a sort of rough shot gun method of getting the germs after they are distributed in the environment, a method of killing the marauders scattered through the open woods. But we are coming more and more to realize that the greatest danger comes from the fresh germs just as they leave the body, a large majority of infections being due to pretty direct transfer. Although gaseous disinfection is useful to kill the germs that have escaped, the greatest economy of effort comes in concentrating attention on those germs as they leave the body, on the portals from which the germs escape, the discharges from the mouth and the discharges from the intestines.

Dr. Hill said very little about typhoid fever, but that is one case in point. In this country there is a very grave neglect of proper disinfection of the excreta in typhoid fever. We have a death rate in this state of from 15 to 20 per 100,000 in communities where the water supply is entirely irreproachable, and where from a study of the conditions it appears evident that milk causes no large proportion of the disease. This death rate is mainly due to infection carried in a roundabout way by undisinfected excreta, material which gets on fingers, or is carried by flies, or food, in some way reaching the mouth. In Germany they have only half that death rate, and I believe this is due to the greater care that is exercised in the disinfection of the excreta.

So in tuberculosis. It is well understood now that the maximum effect can be produced by concentrating attention on the sputum of the patient, and it seems to me perhaps that a solution of this matter of isolation can be reached along somewhat the same line. If a tuberculous patient cares for his sputum he need not be strictly isolated. In that disease of course the strict isolation of the afflicted persons is impossible, but by making a patient care for his sputum we secure a practical isolation.

I wonder if it is not possible to a certain extent to attain that in the case of diphtheria, if it is not possible by printed instructions, and perhaps by personal instructions given by the agent of the Board of Health to the infected person and to the members of the family of the infected person, to secure what is as good as isolation, the care of the points from which infection goes. If those persons who are released, according to the rules adopted in Providence, while they still carry with them virulent diphtheria bacilli, can be instructed as to the possible danger, that can be avoided by the use of clean individual tumblers and spoons and utensils, and by the sterilization of personal body clothing, it seems to me that a large gain may be made .

MR. COFFEY: Mr. Chairman. I would like to ask Dr. Chapin what he does, during the progress of the disease, with the other members of a family in which a case of diphtheria develops. Do you quarantine them, or do you allow them to pursue their usual avocations?

DR. CHAPIN: Mr. President, the majority of people are allowed to pursue their usual avocations. A school teacher, or a nurse, or a conductor on the electric cars, or a letter-carrier, or a milkman, would not be allowed to do so without repeated cultures from throat and nose. And, as I said, the children in the family are never allowed to go to school under four week, unless all of the children have shown two negative cultures from throat and nose.

MR. COFFEY: Mr. Chairman, I confess that just at present I am somewhat puzzled on the question of diphtheria. At Worcester just now we are suffering from an outbreak of diphtheria larger than anything we have had for a great many years. We are pursuing exactly the same course now that we have always pursued and which heretofore has seemed to work effectively. Worcester is a city of 135,000, and we have had, as perhaps some of you know, a very small amount of diphtheria for years. It has averaged something like 225 cases a year for ten years, and that included the year 1900, in which something like 500 cases developed, so that the average number of cases, eliminating 1900, is something a little over 100 a year for a number of years. And yet this year, in August, when the schools were not in session, diphtheria developed, and of a particularly infectious type. It has been so infectious that it has led me to believe that there is something in this that we don't know much about, in other words, there is a factor of susceptibility and immunity to be taken into consideration.

Why is it that heretofore, until this year, in the ordinary family,—I have seen it year in and year out,—one child would have diphtheria and the other children of the family would be about it in the three or four rooms, and not another child in the house would take it, while this year, almost without exception, wherever the disease has developed nearly every member of the family has contracted it? We have taken out of some houses five children in various stages of the disease. It is not at all uncommon this year for three, four, five, six and seven in a family to contract the disease. It started in, as I say, in August, and was not recognized. A great many of the cases when first brought to our attention were in the septic stage. In some cases the physicians were at fault. They were called and regarded it as tonsillitis, and did not take any cultures, and were not alarmed until the septic stage was reached. Several deaths were due to those two causes, ignorance on the part of the patient in not calling a physician in time, and ignorance, I am sorry to say, or negligence, on the part of some physicians, to take the usual precautions to see whether the disease was diphtheria or not. I am led now to the belief that the factor of susceptibility and immunity plays a large part in the spread of that particular disease, and if in the spread of that disease why not in the spread of others?

We are pursuing exactly the same course, as I say, this year that we have always pursued with splendid results heretofore. We require a single negative culture for release when the patients stay at home; we require two successive negative cultures for release when they are at the hospital. Now, I know, and every practical health officer who is brought in contact with the people knows, that the average isolation in the average family is a farce. It is impossible with the methods and means at our disposal to place at the door of every house an officer to see that the quarantine rules are carried out effectively. We leave at every house, as one gentleman here suggested, a printed circular, giving simple rules for the care of the patient, the clothing, bedding and the excreta of the patient. I am now finishing my twenty-third year as health officer of Worcester, and my experience has been that people are very much afraid of diphtheria when some one else has it but when the average person has contagious disease in his family he does not seem to care if the rest of the town gets it or not.

We require, as I say, one negative culture, and we also require that a release culture shall not be accepted until 10 days have elapsed from the day the culture for diagnosis was taken. I have a theory in regard to that, which I will give for what it may be worth. If in ten days no other member of the family contracts the disease, isn't it reasonable to suppose that the family is practically immune, that if they are going to take it they will do so within those ten days, considering, always remember, the average amount of quarantine and of isolation, or lack of isolation, which there is in the average household. So that it seems to me if they go ten days without any other member of the family contracting it, it is due largely to the fact that the other members of the family, at that particular time, are to a greater or less extent immune to the disease and will not take it any way. Under those conditions one negative culture is as good as two.

For a number of years I have noticed that the average number of cases in a family would be one, very seldom two, while this year the disease seems to be particularly infectious. At present it is not virulent. Whether this is due to the fact that we are getting the cases earlier now than we were in the beginning of the outbreak, or whether it is due to the fact that the type is less virulent than at first, I don't know. The fact is we have not had a death for about three weeks, while we have had something like 100 or more cases reported in that time. I am led to the belief that immunity and susceptibility are large factors in this whole question. The bacteriologists and the scientists are trying to solve the problem of why it is that some people are immune to certain diseases at times. I believe it is understood that an individual may be immune at one time and susceptible at another. I believe also that the New York Board of Health are now at work on that very problem. They are taking specimens of blood from the ears of patients and testing it to discover the amount of susceptibility or immunity there may be at that particular time in the blood. When that matter is solved, I think we will have a factor which will aid us largely in the controlling of contagious diseases.

Certainly my own experience is, as I have said before, that the ordinary quarantine and isolation as practised in the ordinary household is not very great. In Boston they have a hospital large enough to take almost every case where the house conditions are such that there is no chance of isolation. That we cannot do at Worcester, because our hospital is not large enough, and we never have attempted to do it on that account. Of course the health officers have by law the authority to take them, in spite of their families. But we have not room, and I think that is true of every other city in the state except Boston. Now, we find that a great many people will not allow their children to go to a hospital, but will keep them at home, and I know, and so must every practical health officer know, that it means very little isolation and very little in the way of a quarantine where they are allowed to remain at home.

We do this in addition. If any member of the family is employed in a store, where he is dealing with the public, we make him either send that child to the hospital or leave the house. If he is a letter carrier, or a motorman, or a conductor, or in fact carrying on any work that brings him in contact with large numbers of the public, he must either get out of the house or allow the child to go to the hospital. Outside of that, quarantine in the house, I am sorry to say, is not very effectual.

DR. FRENCH: Mr. Chairman, there has been something said here about immunity of the different members of the family. I would like to ask what the custom is as to attempting to immunize other members of the family, except the patient. I suppose it is not necessary to ask if antitoxine is used on the patient. I suppose that is the general treatment. But is it used on other members of the family? Is an attempt to immunize the other members of the family carried out? Dr. Chapin or some one else can tell from observation what the custom is.

DR. COFFEY: I think at Worcester some doctors are very particular about those things, and will immunize the rest of the family, while others are careless and won't. We are ready to furnish antitoxine to them. The State Board furnishes an ample supply, and we are ready to give it, and we urge it, but they don't always do it. There is a prejudice among some doctors against using antitoxine very freely, because of the after rash that occurs in some instances, which is very annoying when it does occur, and they are a little in dread of it. It is not done very freely.

DR. ROSE: Mr. Chairman, I would ask if the antitoxine destroys the virility of the bacillus after it is introduced into the individual. Will it destroy the virility of all the rest of the diphtheretic bacilli in the individual?

MR. RICKARDS: If I may be permitted a word or two more, I might answer that first question by saying I know the State Board of Health uses the antitoxine which is returned to it as of no value, in other words, antitoxine which is clouded, for making serum for their diphtheria outfits. There seems to be no specific action between the antitoxine itself and the organism, since that serum will produce a most abundant growth of diphtheria bacilli.

It seems to me that an analogy might be drawn between the question of isolating and releasing diphtheria patients and our police system. In the latter case we have a state prison, which is filled with prisoners who have been caught redhanded, so to speak. These men have committed crimes, it has been proved against them, and they are in isolation. They can be compared with those cases of diphtheria where the full evidence is upon them; in other words, where you have the full clinical signs. Then, again, there are people at large who have committed crimes in the past, perhaps have served their sentences and are again at liberty. Now, those people are a danger to the community in a way. They may not have reformed and may commit other crimes. You may watch them, but you cannot imprison them again until they have again committed crime; that is, proved "virulent" and a source of danger to others. There you have practically the infected well person. He is not sick himself, and until you prove that he is going to infect somebody else you can hardly isolate him. Then we have, beside that, those people who have been in bad company and are very likely to become criminals. We might compare those to exposed well persons. We don't know what is going to become of them. They may turn out criminals, and they may not. They need prophylactic treatment.

The virulence of diphtheria organisms isolated from exposed well persons is much lower than is commonly supposed. Figures from various sources would seem to place it as low as fifteen to twenty per cent. In the work done by this Association on diphtheria in well persons, while there were only a comparatively small number of virulent tests made, the work then done went to show that the organisms were usually non-virulent. There were a total of about 75 tests made, if I remember rightly, some of them in persons who were exposed and some in those who were not exposed, and it was only a matter, I think, of somewhere round a dozen cases that proved virulent, those that were not exposed to diphtheria, but who carried the bacilli, were almost invariably found with organisms which were non-virulent.

Just one word more, in regard to what Dr. Barnes had to say about humidity as a factor in disinfection. The point seems to be that to get the best results you should have saturation, and the nearer you approach to saturation the nearer you approach to perfection in disinfecting. You can take an immense amount of dry gas, and with an extremely low humidity, such as we get in the winter time in furnace or steam heated houses, it will take a very large amount of gas to disinfect a room. On the other hand, if you have that room practically saturated, however you may accomplish that, whether it be by some machine that will throw steam into the room, or whether you sprinkle the floor, or whatever you do, if you can approach closely to the point of saturation, then a very small amount of gas will accomplish the same amount of work as a very large amount of dry gas. That, I think, has been proved conclusively.

One thing more, a point that is not brought out in Dr. Hill's paper, and that is in regard to the use of machines generating formaldehyde directly from methyl alcohol. In some experiments which I carried on some time ago I found that in the majority of cases where methyl alcohol was used, heated and passed over say a glowing copper spiral, or a platinum sponge, or platinized asbestos, even under the best conditions there was a large amount of unchanged methyl alchohol thrown into the room, beside which there was also a comparatively large amount of formaldehyde which was destroyed, or rather it was broken down to water and carbonic acid gas, which gas, so far as we know, has very little effect in destroying disease organisms.

DR. HILL (discussion added in writing).

In reply to Dr. Barnes' question I may say that it is the relative humidity to which I refer in my paper. I am quite aware that the natural relative humidity of different parts of the country varies immensely, from place to place as well as at each place from day to day. Being for some years on the Disinfection Committee of the American Public Health Association, I have endeavored, so far unsuccessfully, to secure a set of statistics on the relative humidities of the chief cities in each state of the Union of such a character as to be of service in these calculations. In prescribing certain mixtures of formalin and water, Dr. Barnes states that the amount of water prescribed would not at times suffice to raise the humidity to the desired point, (which I may say is "the higher the better" preferably 100 per cent (saturation)). But it must be remembered that the formalin itself contributes 60 per cent of its own weight of water to the mixture.

Thus 20 ounces of formalin contains 12 ounces of water;

a mixture of 10 ounces of formalin with 10 ounces of water contains altogether 16 ounces of water while a mixture of 5 ounces of formalin and 15 ounces of water contains all told 18 ounces of water. In other words, this series of mixtures is such that the humidity secured rises in amount as the formaldehyde gas diminishes—and these are exactly the conditions desired—the less gas, the greater the required humidity—the more gas, the less the required humidity—within limits, however for a really dry gas, acting on really dry organisms, is inert. As to the inefficiency of these amounts of water vapor in affecting the humidity of 1000 cubic feet of space, I may say that at ordinary warm temperatures, say from 60° to 70° F. from 17 to 20 ounces of water per 1000 cubic feet is roughly the maximum that the atmosphere can contain. If the atmosphere has a natural humidity of say 33 per cent (which is surely not a high figure for a room recently occupied by a patient) two-thirds only of this 17 to 20 ounces would require artificial addition to secure complete saturation. If the natural humidity be 50 per cent, only one-half this amount need be artificially added. Hence the amounts of water vapor prescribed, quickly and completely evaporated, are usually sufficient to secure the high humidity desired. In the extreme cases described by Dr. Barnes, more water vapor should be generated, but these extremes are not usualy encountered in practice. Under conditions where hygrometric measurements can be made, and the atmosphere actually brought to 100 per cent saturation, a single ounce of formalin instead of the minimum of 5 ounces above prescribed per 1000 cubic feet is sufficient to kill fresh diphtheria bacilli in forty minutes.

Mr. Rickards has pointed out my omission of the method of securing formaldehyde by direct generation from methyl alcohol. He has also pointed out the difficulties and objections easily raised against this method and it remains for me only to acknowledge the oversight.

Mr. Winslow comments on my omission of directions regarding disinfection for typhoid fever, but a perusal of my paper will show that I specifically set aside, for present purposes, what may be termed concurrent disinfection, i. e., that to be carried out during the course of the disease—in order to devote myself to what Chapin has so aptly termed terminal disinfection. Moreover, while occupying a large share of your time, I have not been able to more than skim over the subject—and I must crave the indulgence of all those who detect the frequent omissions of matter which might well have been added.

DR. DENNY: It is very profitable to discuss again at this time the release of diphtheria patients, after we have had experience with the different methods. I think when we discussed it before it was too new for us to have any very definite ideas. The only objection to the culture system is that there are some few cases which are detained too long. If we treat these prolonged cases in a different way it is possible to obviate a great many of the objections of that system. Let every case that persists over four weeks be released "on probation" (to carry out Mr. Rickards's simile of the police system). Allow such an individual to go out in the air, and if it is an adult, let him resume his occupation if he can do it without exposing others; but do not let a child go to school and do not let any one resume work who has an occupation which would endanger others. I think if we can specialize on those few cases that persist over four weeks we can do away with a great many of the objections to the cultural method. In an intelligent community, where the culture method has been thoroughly carried out and the people understand about it, I think it would be very difficult to take up a time limit. People would be very much afraid to have their children play with other children, whom they knew might have the germs in their throats. I think it would be very difficult for us in Brookline, for instance, to take up at the present time any other method than the cultural system of release.

DR. HOLDEN: There is one point that in my judgment has not been sufficiently brought out in this discussion, and that is this: The investigation of the unrecognized case. In very many instances of cases reported and recorded, the patient is isolated, and that is the end of infection from that case. The point I wish to make is that the source of infection of that case should be sought for, and sought for with the utmost rigor. In many cases it would be found that there had been an unrecognized case in the family or in individuals with whom the patient had close contact. To illustrate, some four weeks since a case of diphtheria was reported in Melrose. There had not been another case in that vicinity for some time. I went to the house and found that the case was a child about six years old, who had not, so far as I could learn, come in contact with any other suspicious person, except possibly his brother, who had recently come from a neighboring city. Further investigation disclosed that this boy at the time of his coming to Melrose had a very nasty nasal discharge. A culture proved positive and the case was promptly isolated together with .the other one. Now, if the source of infection had not been sought for and found, we might have had half a dozen cases during the time that this patient remained capable of conveying the disease, and as we know, it is the nasal case, often the mild nasal case, that is the most dangerous. I might multiply instances and I recall many, but it is not necessary. And the same rule will also apply to scarlet fever. It is the unrecognized case that is our great danger. We lay great emphasis upon the isolation of the case after we find it, the quarantine of the family, the disinfection of the rooms, but we pay too little attention to looking for the unrecognized case.

MR. J. ALBERT NYHEN: Mr. President, seeing the discussion is about over and we are about to adjourn, I wish to introduce something for the members to think about in the interval existing between now and our next meeting, that is, the subject of finger print identification as necessary for public record in the vital statistics. That would be a very interesting subject, and it is one that is bound to come up, one that has got to be considered in the immediate future. It would be very interesting to hear that subject discussed at a meeting in the future.

THE PRESIDENT: Is there anything else to be said upon this most interesting subject? If not, Dr. Durgin moves that this meeting now adjourn.

(The motion was adopted, and the meeting adjourned).

STATEMENT CONCERNING JOURNAL.

By Dr. H. W. Hill, Associate Editor.

NOTE.—This communication, relating to the financial condition of the Journal, was received from Dr. Hill too late for presentation at the October meeting of the Association. It is therefore inserted here.—Managing Editor.

In July, 1905, the financial prospects of the Journal, calculated from the accounts as they stood at that time, showed a possible excess of returns over expenditures per year. Unfortunately bad debts—i. e., delinquent subscribers—have developed, who have been repeatedly billed without effect. Present prospects point to the Journal continuing to pay for itself under present arrangements, and while expansion and advance cannot but be slow, if returns are not in excess of expenditures a decided step is gained in merely maintaining a Journal of this character. Hygienists everywhere should support it, and it is now in a position where every additional subscription means the opportunity for further development. The services of the whole staff are given free and ungrudgingly, for the good of the cause, and if hygienists can be induced to see that they should support a journal of scientific and strictly professional aspirations, open to all professional hygienists in this country, there can be no doubt of its ultimate success. The names of the contributors and collaboration guarantee that only the best of material will be presented to its readers. A renewed and vigorous effort to bring the Journal pointedly to the attention of all hygienists will be made by the new Managing Editor.

MUNICIPAL SANITATION.

By Charles V. Chapin, M. D.,

Superintendent of Health, Providence, R. I.

ISOLATION IN THE MINOR INFECTIOUS DISEASES. The following rules have recently been adopted by the London County Council.

(vi.) Children suffering from the following diseases must be excluded from school for the undermentioned periods: Mumps, for one month; chicken-pox, for at least two weeks, or until every scab has fallen off the scalp or body; whooping cough, for as long as the cough continues, and not less than five weks from the commencing of the whooping.

(vii.) Children coming from houses in which either mumps, chicken-pox, or whooping cough exists must be dealt with as follows: (a) Children in schools other than infants' schools who have not had the disease and all children in infants' schools must be excluded. (b) Children in schools other than infants' schools who have had the disease need not be excluded.

(viii.) Children living in infected houses and excluded from school under section vii. (a) and (b) must absent themselves for the undermentioned periods: Mumps, for such time as the medical attendant dealing with the case deems necessary or, in cases where there is no medical attendant, for three weeks; chicken-pox, for two weeks; whooping cough, for two weeks.

RETURN CASES OF DIPHTHERIA. The London Health Authorities are still investigating the problem of the recurrence of infectious disease in the family after the return of the patient from the hospital. Previous reports have been made by Drs. Simpson and Cameron. The last report is by Dr. F. M. Turner*. In Dr. Cameron's series the number of return cases was 1.2 per cent of discharges. In Dr. Turner's series it was 1.1 per cent. In Dr. Cameron's group cultures were rarely taken before the discharge of the patient, but the custom has since been inaugurated in the London hospitals of requiring negative cultures before discharge, though there is no general rule as to the number of cultures required. The slight decrease in the proportion of infected cases leaving the hospitals since cultures have been employed cannot be attributed to this practice, for Dr. Turner states that in the North Eastern Hospital, where three throat and two nose negatives are required, the infectivity rate has actually risen.

SANITARY ENGINEERING NOTES.

By Robert Spurr Weston, Assoc. M. Am. Soc. C. E.

EFFECT OF COPPER ON WATER BACTERIA.**

The authors' experiments show that harmless bacteria in water supplies are not appreciably affected by certain small doses of copper sulphate sufficient to kill the harmful kinds of bacteria. They further state that carbon dioxide lessens the destroying power of copper sulphate, but that it has no effect upon the bactericidal action of metallic copper.

The authors fail to state what the effect would be upon the other plant and animal life to which bactericidal doses of copper were added. Others experience goes to show that fish are killed when copper is added to water in large doses.

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*Abstract of report in "Public Health," October, 1906, p. 30.

**Kellerman and Beckwith, U. S. Bureau of Plant Industry, Bulletin No. 100, Part VII.

The authors mention the use of copper sulphate in connection with water purification and advise that in mechanical filtration of hard waters copper sulphate be added some hours before coagulation, since after the addition of sulphate of alumina a hydrate of copper and aluminum appears which precipitates as under direct bacteriacidal action.

The authors state that where copper sulphate and iron sulphate are used together in the purification of water, the copper retains its toxic properties. The latter diminish, however, in the presence of carbon dioxide. When copper salts are used in connection with slow filtration plants they should be added to the effluent, otherwise the toxic effect is lessened.

SULPHATE OF IRON AND CAUSTIC LIME AS COAGULANTS IN WATER PURIFICATION.[†]

The use of sulphate of alumina as a coagulant in water purification is quite generally understood. Also the use of caustic lime as a reagent for water softening. Furthermore, lime and sulphate of iron in combination have been used to precipitate sewage for many years. Of late years this combination of chemicals, used originally for sewage precipitation, has been adapted to water purification. The causes of this development have been the popular prejudice against the use of alum, the low price of sulphate of iron (a by-product of the manufacture of steel) and lime, and the softening action of the lime when added to water containing calcium and magnesium bi-carbonates. The adaptation of this latter process has not been an easy task, because of certain physical and chemical difficulties. The reaction is not so speedy as that with sulphate of alumina, although when the calcium is once precipitated it acts much faster than does aluminum hydrate, which is the result of the addition of alum or sulphate of alumina to water.

[†] J. W. Ells,—paper before Central Water Works Association, 1906. Also Engineering Record, 1906, page 439.

To begin with, the iron hydrate, which is the active coagulating agent, is precipitated in the soluble ferrous or unoxidized form and slowly oxidized to the insoluble ferric form. The coagulant must be oxidized or it will not be removed in the purification process. The main retarding agent is carbonic acid. To remove this lime is added, in excess not only of the carbonic acid but of the calcium and magnesium bi-carbonates also. This addition also softens a water and, where magnesium is present, throws down magnesium hydrate, which also acts as a coagulant.

The process is particularly adapted to turbid waters containing calcium and magnesium bi-carbonates. Soft waters and those containing dissolved color have not yet been successfully treated by this process,—probably because of lack of scientific experience rather than because the process cannot be applied. The waters of the Southern seaboard are also difficult to treat,—probably because of the small amount of magnesia contained in them. Experience has shown that the precipitate of calcium carbonate formed by the addition of lime to water crystalizes and settles very slowly.

In any case the process must be controlled by a competent chemist and ample means must be employed to effect precipitation of the carbonates, lest "after deposits" be formed in filters and distribution systems. The sedimentation of turbid waters treated by this process is very rapid, because of the relatively high specific gravity of the iron hydrate (ferric hydrate). It eliminates the necessity of preliminary sedimentation often necessary where sulphate of alumina is used. Smaller coagulating basins may be used and sudden fluctuations in turbidity may be treated successfully without excessive amounts of chemicals. Most of the work of purification is therefore done in the coagulating basin, thereby relieving the filters and increasing their net capacity, as they do not require washing so frequently.

The decreased cost of the treatment is a great advantage; especially is this true where the amounts of suspended matter are large. In some cases the cost may be only one-half of the cost of sulphate of alumina. The process is already in use in several cities, (St.. Louis, Ashland, Ky., and others), and is to be adopted in Columbus, O., Cincinnati, O., and New Orleans, La..

LABORATORY NOTES.

By Frederic P. Gorham,

Associate Professor of Biology, Brown University, and Bacteriologist, Providence Health Department.

The rapidly increasing literature regarding the Protozoa contains many new methods of cultivating and staining these organisms. In the February number of this Journal we noted methods for isolating Trypanosomes and we now give some of the more recent methods for the cultivation of Amebae, the staining of the Spirochetes of syphilis, and the Negri bodies of rabies.

CULTIVATION OF AMEBAE. Musgrave and Clegg* recommend as a routine procedure for the isolation of amebae from water, etc., but not from stools the following method: To 100 to 500 cubic centimeters of the material to be examined add 0.5 to 1.0 cubic centimeter of ordinary 1 per cent alkaline nutrient bouillon to every 100 cubic centimeters of the sample. Set aside for 24 to 72 hours, when an examination usually shows amebae on the surface. Spread a loopful of this culture over the surface of a Petri dish containing the following medium: Agar 2 per cent, sodium chloride 0.3 to 0.5 per cent, beef extract 0.3 to 0.5 per cent, made as ordinary nutrient agar, 1 per cent alkaline to phenolphthalein, with or without the addition of 1 per cent peptone. In 6 to 48 hours amebae on the surface can be seen readily.

For stools the above method is not satisfactory, because of the selectiveness of amebae from the intestine for certain bacteria. For the isolation of amebae from stools the surface of several plates should be smeared with pure cultures of various kinds of bacteria, preferably isolated from similar stools, and then inoculated with the intestinal contents. It will be found that amebae will develop upon one or more of these plates but not upon all.

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*Publication of the Biological Laboratory, Bureau of Government Laboratories, Manila, No. 18, October, 1904.

To get a pure culture of amebae in either case the procedure is as follows: Select a plate culture on which the parasites are well distributed, place on the stage of a microscope and find, by searching with a Zeiss AA objective, a point where the amebae are some distance apart, swing into position a clean and perfectly dry DD lens and gently lower it until the entire surface is in contact with the medium, raise the lens, remove it from the microscope and gently rub it over the surface of a Petri dish containing the medium. Examination of the two plates will determine whether the amebae has been picked up or not. If properly performed this will give a pure culture of the amebae and a culture of bacteria which may or may not be pure. To obtain a pure culture of the accompanying bacteria several concentric rings of the organism with which it is desired to grow the amebae are made on a sterile Petri dish containing the medium, and a small smear inoculation of the mixed culture is placed in the middle of the smallest ring. The amebae as they multiply will spread over the plate, and in from 24 to 48 hours will have passed through one or more of the rings, and in so doing will have lost the organisms with which they started and have taken up those which form the rings. Inoculations from the outer rings will give the desired pure cultures.

STAINING SPIROCHETA PALLIDA. Goldhorn recommends* the following technique for smear preparations of Spirocheta pallida:

After sufficient curettage at edge of lesion to cause the appearance of a small amount of serum and blood, make impression preparations. If lesion is in mouth or vagina, after gentle curettage, remove a little blood with a platinum needle and smear on slide. Blood smears from lobe of ear are usually negative. For staining the author remarks that "the Giemsa staining method, which is based upon the Nocht-Romanowsky principle of staining is so time-consuming where the question of a possible quick differential diagnosis is to be considered as to be quite useless .. . . Besides this, we have to deal with the disadvantage that the organism is stained so lightly as to be readily overlooked. One can safely state that there is no modification of the Romanowsky method which will not stain the pallida but I believe the results to be less brilliant than those obtainable by the method I am about to describe."

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*Journal of Experimental Medicine, VIII., 1906, 451.

To 200 cubic centimeters of water in which 2 grams of lithium carbonate are dissolved add 2 grams of methylene blue, (Merck's medicinal, or Grubler's BX, or Koch's rectified). Heat moderately in a double boiler until a rich polychrome is formed. This may be determined by examining a sample every few minutes in a test tube against artificial light; a distinctly red color denotes the proper stage. Allow to cool spontaneously, filter through cotton, and to one half the filtrate add gradually 5 per cent acetic acid until litmus paper shows a distinct acid reaction above the line of discoloration, then add the remaining half of the stain. Add gradually, while stirring, an approximately one half per cent solution of French eosin, until a filtered sample shows the filtrate to be of a pale bluish color with slight fluorescence. Allow to stand one day, filter, collecting the precipitate on a double piece of filter paper, dry at room temperature or not over 40 degrees C. When completely dry dissolve in commercial wood alcohol, allow to stand one day in an open vessel and filter.

To stain the smears drop sufficient stain on the unfixed smears to cover and allow to act 3 or 4 seconds, pour off the excess stain and introduces the slide slowly into clean water, film side down, hold in the water 4 to 5 seconds, then wash off the excess stain. Pallida should appear violet in color and this may be changed to bluish black by flooding the slide for 15 to 20 seconds with Gram's solution. Wash and dry.

DIAGNOSIS OF RABIES. For rapid diagnosis one of the best stains for the demonstration of the Negri bodies is that of Van Gieson. It is employed regularly at the Laboratories of the New York Department of Health, the New York Pasteur Institute, and has been found extremely satisfactory in our own laboratory. The technique is as follows:

1. Cut away the top and occipital region of the skull and without removing the brain take pieces the size of a BB shot from the cervical cortex in the region of the crucial sulcus, from the cortex of the cerebellum and from the hippocampus major.

2. Place one of these pieces half an inch from the left end of a slide which has been cleaned with soap and water, acid alcohol and the free flame, cover with a clean cover-glass, press down gently until the brain substance spreads to the edges of the cover. Draw the cover-glass to the right, slowly and evenly across the slide.

3. The smear thus made is placed with or without drying into wood alcohol for one to three minutes, and dried in the air.

4. Prepare a stain as follows: 2 to 3 drops of a saturated alcoholic solution of rose anilin violet, 4 to 6 drops of a 50 per cent solution of methylene blue, 20 cubic centimeters of distilled water. Flood the slide with the stain, heat gently until steam arises, wash in water, dry with filter paper.

In well made and well stained smears the Negri bodies appear as pink, crimson or magenta inclusions in the blue nerve cells. The nuclei of the nerve cells are blue and the blood corpuscles are yellowish red. Whether the bodies stain pink, crimson or magenta seems to depend upon the condition of the material examined and upon the proper mixtures of the stains. It will often happen that a mixture which is successful in one case will be worthless in another and the mixture must then be modified by using a little less rose anilin violet.

In addition to the above method that of Giemsa* or that of Mallory‡ though longer and more complicated, is preferred by some. The section method § is still longer and more tedious and has nothing to recommend it over the smear method.

BOOKS REVIEWED.

The second report of the Wellcome Research Laboratories, Gordan Memorial College at Khartoum, Sudan, has been received from the director, Dr. Andrew Balfour. The functions of the Laboratories as outlined by the director, are:

a. To promote technical education.

b. To promote the study, bacteriologically and physiologically, of tropical disorders, especially the infective diseases of both man and beast peculiar to the Sudan, and to render assistance to the officers of health, and to the clinics of the civil and military hospitals.

c. To aid experimental investigations in poisoning cases by the detection and experimental determination of toxic agents, particularly the obscure potent substances employed by the natives.

d. To carry out such chemical and bacteriological tests in connection with water, food stuffs, and health and sanitary matters as may be found desirable.

e. To promote the study of disorders and pests which attack food and textile producing and other economic plant life in the Sudan.

f. To undertake the testing and assaying of agricultural,

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*‡Williams and Lowden, Journal of Infectious Diseases, III., 1906, 460.
§Frothingham, Journal of Medical Research, XIV., 1906, 471.

mineral and other substances of practical interest in the industrial development of the Sudan.

The volume was received too late for a detailed report in this number. A somewhat cursory examination reveals very much to interest the sanitarian. The book itself is well bound, well arranged and excellently illustrated.

In addition to an interesting report on the routine work of the Laboratories, a report of the Chemical Laboratory by Dr. William Beam and a report by the Travelling Pathologist and Naturalist, Dr. Sheffield Neove, the book contains special articles on "Mosquito Work in Khartoum and the Anglo-Egyptian Sudan," "Biting and Noxious Insects other than Mosquitos," "A Haemogregarine of Mammals;" "A Leucocytozoon of Mammals," and "Changes in the Erythrocytes of the Jerboa." Mr. F. V. Theobald, Consulting Entomologist, furnishes a chapter on Culicidae, Human and Animal Pests and Vegetal Pests. Mr. E. E. Austin of the British Museum contributes an article on "Biting Flies of the Sudan."

It is of interest to note that the founder of the Laboratories, Mr. Wellcome, and the Chief of the Chemical Section, Dr. Beam, are Americans.

B. R. R.

THE SANITARY CONFERENCE.

The Sixth Annual Conference of Sanitary Officers of the State of New York was opened at Syracuse by Dr. D. M. Totman, the efficient health officer of the city, on Wednesday afternoon, October 24th, a large number of sanitary officers convening in the City Hall. After addresses of welcome from various prominent local authorities an extensive program extending over several days was presented. Lack of space prevents the presentation of the details of the program here. Some of the subjects treated were the diagnosis, prevention and treatment of communicable diseases; the examination of water; and disinfection and disinfectants.

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CONTENTS:

EDITORIALS— PAGE

Dirt and Disease 337
Individual Hygiene (*Cabot*) 339
APRIL MEETING—Boston, Mass. . . . 343
Cerebro-Spinal Meningitis (*Councilman*) . 344
Powers of Health Boards (*Babson*) . . 357
VETERINARY SANITATION (*Moore*) . . . 369
MUNICIPAL SANITATION (*Chapin*) . . . 371
SANITARY ENGINEERING (*Weston*) . . . 375
CANADIAN NOTES (*Amyot*) 381
PREVENTIVE THERAPEUTICS (*Pease*) . . . 382

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CONTENTS:

EDITORIALS—

PAGE
American Public Health Association . . . 389
Reporting of Ophthalmia 391
JULY MEETING—Gallup's Island . . . 394
The Brown-Tail Moth (*Kirkland*) . . 397
PREVENTIVE THERAPEUTICS (*Pease*) . . . 422
MUNICIPAL SANITATION (*Chapin*) . . . 427
SANITARY ENGINEERING (*Weston*) . . . 430
VITAL STATISTICS (*Fulton*) 433
LABORATORY WORK (*Gorham*) 438

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CONTENTS:

EDITORIALS —

The Writing of Health Reports (*Chapin*) . . . 439

American Public Health Association 442

OCTOBER QUARTERLY MEETING — Boston, Mass. . . 445

Rabies (*Frothingham*) 446

Notes on Recent Meeting of American Public Health Association (*Richards*) 462

Recent Outbreak of Typhoid Fever at Springfield (*Magrath*) 467

MUNICIPAL SANITATION (*Chapin*) 480

SANITARY ENGINEERING (*Weston*) 481

LABORATORY NOTES (*Gorham*) 486

VETERINARY HYGIENE (*Moore*) 489

CANADIAN NOTES (*Amyot*) 493

BOSTON:

THE MASSACHUSETTS ASSOCIATION OF
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SAMUEL H. DURGIN, M. D. . . . . Editor

CONTENTS:

EDITORIALS —

Executive Sanitarians as Specialists (*Bracken*) . . 497
The Relations of Executive to Technical Men . . 500
Chicago Vital Statistics (*Fulton*) 502
JANUARY QUARTERLY MEETING — Boston, Mass. . 507
What is the Relation of Human and Bovine Tuberculosis, and How Does It Affect Inmates of Public Institutions? (*Smith*) 516
Causes of Deaths in Providence, 1856-1905 (*Chapin*) 529
MUNICIPAL SANITATION (*Chapin*) 541
SANITARY ENGINEERING NOTES (*Weston*) 544
LABORATORY NOTES (*Gorham*) 546
PREVENTIVE THERAPEUTICS (*Pease*) 554
VETERINARY SANITATION (*Moore*) 558

BOSTON:
THE MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH.

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MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH

SAMUEL H. DURGIN, M. D. . . . . Editor

CONTENTS:

APRIL QUARTERLY MEETING—Boston, Mass. . 569
Some Personal Experiences with the Gypsy and Brown-tail Moths (*Underwood*) . . . 570
The Work of Suppressing the Gypsy and Brown-tail Moths (*Supt. A. H. Kirkland*) . . . 590
MUNICIPAL SANITATION (*Chapin*) 604
SANITARY ENGINEERING NOTES (*Weston*) . . . 607
LABORATORY NOTES (*Gorham*) 618
PREVENTIVE THERAPEUTICS (*Pease*) 621

BOSTON:

THE. MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH.

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SAMUEL H. DURGIN, M. D. . . . . Editor

CONTENTS:

EDITORIALS

Chicago Vital Statistics Again (*Fulton*) 631
The Real Significance of Bacterial Standards (Counts) for Milk (*Hill*) 636
JULY QUARTERLY MEETING—Boston, Mass. . 641
Some of the Advantages of Certified Milk (*Norris*) . 642
The Projected Work of the Milk Commissioners of the Suffolk District Medical Society (*Morse*) . . 648
National Pure Food Law and Its Possible and Probable Effect upon the Food Supply of Massachusetts (*Harrington*) 669
MUNICIPAL SANITATION (*Chapin*) 677
VETERINARY SANITATION (*Moore*) 680

BOSTON:
THE MASSACHUSETTS ASSOCIATION OF
BOARDS OF HEALTH.

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H. W. HILL, M. D. . . . . Associate Editor
B. R. RICKARDS, S B. . . . . Managing Editor

CONTENTS:

EDITORIAL

New Managing Editor 5
OCTOBER QUARTERLY MEETING—Boston, Mass. . 6
Terminal Disinfection—Reasons and Methods (*Hill*) . 7
The Value of Two Consecutive Negative Cultures as a Method of Releasing Diphtheria Patients (*Rickards*) 25
The Method of Release of Diphtheria patients in Providence (*Chapin*) 30
MUNICIPAL SANITATION (*Chapin*) 50
SANITARY ENGINEERING NOTES (*Weston*) . . . 51
LABORATORY NOTES (*Gorham*) 54
BOOKS REVEIWED 58
THE SANITARY CONFERENCE 60

BOSTON:
THE MASSACHUSETTS ASSOCIATION OF
BOARDS OF HEALTH.

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